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THE
OPHTHALMIC REVIEW

*A MONTHLY RECORD OF OPHTHALMIC
SCIENCE*

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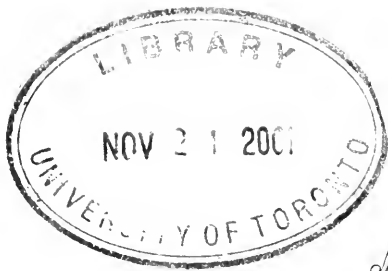


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R. GRUBER (Vienna). Contribution to the Study of the Corneal Circulation. *Graefe's Archiv für Ophthalmologie*, xl., iv., 1894.

There are at present two views in regard to the principal mode of nourishment of the cornea—one which ascribes it to the system of canals standing in close relation to the corneal corpuscles, without active participation by the cells, the other which looks upon the anastomosing cells themselves as playing an active part in nutrition. Certain observations (1877) of Stricker and Norris point to the cells forming the pathway of the nutrient fluid, but this is not inconsistent with its passage also outside the cell walls. In his later works Stricker goes so far as to deny the existence of nutrient canals in the cornea, regarding cells and substance of the cornea as one continuous structure. He considered that part of the nourishment came from the fluid in the anterior chamber.

In studying the question we must carefully distinguish between diffusion and infiltration. The point is clearly put by Pflüger:—"If one inject the solution of a salt into the anterior chamber, which does not exist in the body (say ferrocyanide of potassium), and then discover it in the substance of the cornea, this proves only that an interchange of substances has taken place by diffusion, in which passage of the fluid solvent into the cornea has not necessarily taken place, but only the molecules of the dissolved salt have altered their situation." The difference is important as bearing on the eye, for it is evident that in regard to change of position, or dispersal, a diffusible substance will act otherwise than a non-diffusible, and that from the behaviour of the one, no conclusion can be safely drawn as to the behaviour of the other. The route of diffusion is

open to a crystalloid body such as potassium ferrocyanide or fluorescein, but for the most part closed to a colloid such as albumin or plasma. Knies, Ulrich and Weiss have extended the proposition of His; the first of these authors has gone so far as to ascribe to the exchange of fluid with the aqueous the entire nourishment of the cornea. Ulrich divides the cornea into two vascular areas, the anterior of which is nourished from the peripheral network of vessels, the posterior from the aqueous humour; there are probably anastomoses between the two currents, and certainly the venous vessels of the peripheral network are the gate of exit. Against this must be set the experiment of Coccius, who replaced the aqueous humour by air, and yet the cornea remained transparent.

Gruber proceeds then to discuss (1) The circulation of diffusible or crystalloid substances, and as a preliminary gives a *résumé* of the results of previous observers.

Lehmann found that chromic acid made its way from the concave to the convex surface of the dead cornea.

Laqueur made inter-lamellar injections of ferrocyanide of potassium, and obtained "Prussian blue" reaction both superficially and from the aqueous humour. Injected into the A.C. it gave a characteristic reaction with paper soaked in perchloride of iron at each spot of cornea from which he had previously removed the epithelium; this always took place more quickly at the periphery than at the centre (five to eight minutes at the periphery, twenty to thirty at the centre); and we know that the cornea is permeable in the opposite direction (atropine, &c.).

Cohnheim, on theoretical grounds, believes the course of the nutrient current must be from periphery to centre and so back to periphery—the route of the leucocytes.

Leber, observing that the cornea loses scarcely any fluid from its surface, thinks there can be little interchange by diffusion between cornea and aqueous. Diffusible bodies penetrate the cornea from within just as atropine does from without, so that this interchange of substances under normal conditions must not be over-estimated.

Memorsky injected ferrocyanide of potassium into the

veins, and noted that it was to be found in the fluids of the eye in twenty minutes; the more concentrated the solution the more rapidly was the reaction obtained. The aqueous humour always gave the reaction earlier than the vitreous. When a strong solution of potassium ferrocyanide is instilled into the conjunctival sac, it is not found in the aqueous humour in three and a-half hours, while in the dead dog it is demonstrable in two and a-half (Leber suggests that the substance is not found in the living animal because it has been taken up by the circulation and removed).

Knies experimented by injecting ferrocyanide of potassium into the vitreous humour of the living animal, using an alcoholic solution of chloride of iron to obtain the reaction. An inconstant blue colouring of Descemet's membrane and of the lines of junction of the endothelial cells was all that was obtained in the cornea, but at the periphery he found, sometimes in front of, sometimes among the bundles of the ligamentum pectinatum a blue junction line between the endothelial cells, extending continuously round the cornea as a blue ring, which on meridional section appeared almost right-angled behind, and in front ran sharply into the cornea. The aqueous humour, he considers, finds an outlet through the corneal substance, and in this way assists in its nourishment. Removal by the peripheral veins of the fluids which have passed through the cornea, and evaporation from the surface, are two forces which assist the nutrient currents. He has also made out a current in the cornea from centre to periphery, and considers that the "canal system" is to be regarded solely as a drainage apparatus.

Ulrich injected ferrocyanide of potassium and also uranin subcutaneously, and killed the animal in one and a-half to two and a-half hours thereafter. In both cases examination showed a colouring of Descemet's membrane in its whole extent, and a passage of fluid into the corneal substance. He believes that the filtration stream, after passing through the iris, impinges with a certain strength upon Descemet's membrane, and penetrates into its substance

for a considerable distance before turning into the centrifugal stream; the nourishment of the anterior portion of the cornea comes from the conjunctiva.

Denissenko has experimented in similar fashion, and believes the potassium salt found in the cornea to have come from the aqueous. He considers that nourishment reaches the cornea by the spaces in the sclerotic tissue, then by the corneal canals, that lastly Descemet's membrane is reached, and the fluid passes into the aqueous humour—that the stream, in fact, is centripetal and from before backwards.

Pflüger made a superficial scratch in the cornea, running parallel with the margin; after application of succin-fluorescin a green colouration took place, more marked towards centre than towards periphery; if one marks a circle in the centre of the cornea, the centre is attacked before the periphery. The same result takes place—only more intensely—when the injection is made into the sclera. Lastly he has, on injection of the substance into the anterior chamber (increase of tension being carefully avoided), seen no imbibition by the cornea, and on injection into the vitreous, no fluorescence of the aqueous humour. He considers that there is in the cornea a nutrient current which greatly influences the diffusion process, assisting it in one direction, hindering or annulling it in the opposite. This stream is centripetal and from before backwards, emptying itself into the aqueous at the centre of Descemet's membrane. The current is so strong that it allows diffusion only from conjunctiva into periphery of cornea, and not *vice versa*.

Gifford could not agree with Pflüger's results after injection of fluorescin into the vitreous.

Gruber experimented for himself by introducing between the corneal lamellæ of an anæsthetised cat, a small portion of steel, sharp pointed and heated. When this foreign body is removed twenty-four to forty-eight hours later, a distinct ring of oxide of iron remains behind, without any inflammation of the cornea being caused. If the aqueous humour is now withdrawn and replaced with a few drops

of a 10 per cent. solution of ferrocyanide of potassium sufficient to reinstate the normal tension, but not to increase it, and the syringe then removed, there is no reaction with chloride of iron, but after two to ten minutes a blue reaction from the rust ring. The reaction comes more slowly if a weaker solution is used for injection. The result of this experiment is to show that diffusion in the physical sense is possible out of the anterior chamber into the cornea. Gruber believes that the reason of Pflüger's failure to obtain the same result as he did, was the too great dilution of his solution, and that he would have obtained it with greater saturation; it was too quickly removed from the tissues.

That there is a physical, apart from a vital diffusion, Gruber proved by the following method: Into the upper part of the cornea of a perfectly freshly enucleated eye, he introduced a rusty piece of steel, and suspended the eye for two to three hours in a 10 per cent. solution of ferrocyanide of potassium, in such a way that only about one-third of the cornea was immersed. At intervals a 1 per cent. solution of hydrochloric acid was dropped upon it. A reaction followed when the diffusion-stream had reached the oxide of iron. If the steel particles are introduced at various points in the cornea from centre to periphery, one can watch the gradual advance of the diffusion-stream, which under the above conditions takes from fifty to eighty minutes to reach the edge of the cornea.

In order to discover whether the progress of diffusible substances in the cornea is possible without participation by the aqueous, he used a double experiment, one part of which was practically a confirmatory repetition of that of Memorsky (*v. s.*) Into the cornea of a cat he introduced pieces of steel; one or two days later he injected a 1 per cent. solution of ferrocyanide of potassium into the femoral vein. Blue colouration of the rust ring appeared in eight to twenty-six minutes, and at this time the aqueous gave either no reaction at all, or only a very faint one.

In a further series of experiments he replaced the aqueous by a fluid impervious to ferrocyanide of potassium; pure olive

oil best answered the purpose. The foreign body being introduced, the A.C. was tapped with the utmost care to avoid injury and to obtain complete removal, and olive oil introduced; injection of ferrocyanide was made subcutaneously, as used by Ulrich. Under these circumstances also the ring of rust became of a blue colour in from one to two and a-half hours; the oil when carefully removed showed no trace of the reaction. Microscopic preparations demonstrated, it is true, that absolutely complete removal of the aqueous had not been achieved, as indeed was to be expected, and the minute amount of fluid about the angle of the A.C. gave the blue reaction; but Gruber does not consider that this very slight quantity of fluid can be regarded as vitiating the experiment. In all cases the track of the needle through the cornea, and sometimes even in the aqueous humour, could be seen marked out in blue.

In the two last experiments Gruber was able to see, but not so distinctly as he had hoped, the progress of the colouration from the more peripheral to the more central rust marks. The varying distinctness of the rust rings and the difficulty of determining the precise moment of the first appearance of the colour must be taken into consideration. These experiments, on the whole, confirm Pflüger's first one, but this is not to be regarded as beyond criticism. It must be recollected that the substance employed is diffusible, and, besides, a rent parallel to the corneal margin is a line concave towards the centre of the cornea, and the conditions are thus to a considerable extent different from what hold good at the convex side; at the former the particles are proceeding in a converging, at the latter in a diverging fashion, and therefore there is greater concentration and increased rapidity of diffusion at the former than at the latter side. This may not be the only explanation, but still on theoretical grounds, and now by practical experiment, Gruber comes to the same conclusion as Pflüger, viz., that the diffusion current in the cornea is radial. On the other hand, he cannot agree with Pflüger as to the results of injection of fluorescein into the vitreous, that it does

not appear either in the aqueous or cornea ; repeating this experiment, Gruber found the substance in both situations in from 20 to 40 minutes. First he noticed a very fine streak like a faint smoke rising from the lower margin of the pupil ; this disappeared again, but after some time there was gradually formed at the lower pupil edge a green spot like Ehrlich's streak.

Gruber now proceeds to discuss from a purely theoretical point of view, the question of the circulation in the eye of diffusible substances, taking into consideration, of course, those special circumstances in which the cornea is placed. There are three agents only, so far as we know, which can bring about the circulation through the cornea of crystalloid substances, viz.:—

A.—The mechanical current in the cornea ;

B.—The diffusive stream ; and *C.*, the vital action of the tissue.

A.—The mechanical current in the cornea presupposes an external force, a *vis a tergo* by means of which the material is propelled through the tissue. In the nature of affairs the only force of such a kind is the blood pressure, no matter whether the stream starts from the vascular loops at the corneo-scleral junction or from the choroidal vessels, acting through vitreous, iris, and angle of A.C. (Uirich) : and no matter whether the nourishment of the vascular loops at the C.S. junction comes from the superficial conjunctival vessels (Pflüger), or the deeper scleral vessels (Denisenko). A current implies an inflow and an outflow, which must be equal.

The physical laws regarding such a corneal current will now adopt another form if we in the *first* case, take it for granted that all the material in the current, which comes to it *via* the arteries must leave it *via* the veins, the cornea affording an example of a circulation area complete in itself, cut off from all others ; or, in the *second* case, accept that of all the circulating material, brought by the arterial portion of the network at the periphery, only part is removed by the venous portion, and another part, passing through Descemet's membrane, flows into the aqueous

humour, and is removed; or whether we, in the *third* case, adopt the view that of the material brought by the arteries of the periphery, only a small portion is removed by the veins, and the most part passes by way of the centre of the cornea posteriorly into the aqueous humour, and so is carried off by the angle of the A.C. (Pflüger).

To take the first proposition as above, viz., that the cornea is a circulation area complete in itself (*i.e.*, not communicating with other systems), the inflow coming from the arterial, the outflow leaving by the venous portion of the vascular loops at the margin. The cornea receives its nutrient material from a very great number of small vessels whose respective dimensions differ very slightly, and yields its outgoing stream to a great number of similarly sized vessels. These afferent and efferent vessels, however, communicate with one another at the periphery, and are separated by only very minute spaces. But according to the rule of hydrodynamics applicable to an area nourished in this way, the nutrient current diminishes enormously in energy as the centre is approached, and this the more rapidly the more closely the vessels in the periphery are placed. In no case can the stream reach radially to the centre, or even near it.

After insisting a little further on the attenuation of the current coincidently with the distance from the periphery, and with the approximation of the afferent and efferent vessels, Gruber lays down the formula that the current-pressure may be expressed by $\frac{d}{r}$ where d = distance between afferent and efferent vessels and r = distance from the periphery, but the radial stream diminishes as the square of the distance. In the centre no current is possible, because equal streams meet equal streams travelling along all diameters. It is thus manifest that without an exit into the anterior chamber, a peripheral arrangement of vessels is not adapted to the nourishment of the cornea, for only the periphery could be well nourished, the more central parts only very poorly, and the most central region not at all. The first proposition as to the mode of nourishment of the cornea must therefore be abandoned as insufficient.

The second proposition is next examined, viz., that material reaches the cornea by the arterial and is removed by the venous loops in the corneal margin, but that less departs by the latter exit than has been brought by the former entrance, while a certain moderate proportion of the outflow takes place into the aqueous. As in the last case there is the flow from arterial vessels through corneal substance to venous vessels at the corneo-scleral junction, which current is active at the periphery only, with, in addition, an exit into the anterior chamber, through Descemet's membrane.

Without entering into the arguments for and against this hypothesis it will be enough if we here simply state the conclusions that its adoption would involve. Those who are interested in the question will find it elaborately worked out in the original paper, to which also explanatory diagrams are added.

In the most anterior layers of the cornea (epithelial) there could be, under the conditions involved in the second supposition, no current at all.

The direction of the corneal circulation would be radial and from before backwards.

The circulation slowest in speed in the superficial parts.

In the more superficial layers the route would be mostly radial, the more deep the layer the less the radial current, and the greater that from before backwards; at Descemet's membrane there would be practically no radial current, but an antero-posterior stream only.

The third proposition, and a much less plausible one, is now considered; that, namely, which places the exit in the centre of Descemet's membrane alone. In such a cornea, again, there would be no current at the surface; in other parts a radial and a backward running stream. There would be no great difference in speed between the anterior and the posterior layers. The antero-posterior stream would be greatest at the centre, diminishing rapidly, and indeed practically ceasing as the centre is receded from towards the periphery. As so elaborate and so artificial and improbable a scheme is not required for the

understanding of a radial stream, Gruber does not further discuss this third proposition.

All other schemes of the circulation are practically included in the three above stated, and can be easily understood from their description, *e.g.*, those of Knies and Ulrich, who think that the cornea is nourished either wholly or partially from the aqueous. To comprehend their theories, we have only to reverse the direction of the streams as explained under the propositions 2 and 3.

From the above considerations we arrive, says Gruber, at certain conclusions, thus: If there exists in the cornea a radial current for crystalloid substances, then there must be an exit by way of the anterior chamber; and *vice versa*, if there be no exit into the anterior chamber, there can be no radial circulation in the cornea. If there is no such exit, there can exist only a feeble and peripheral circulation. But if we accept the idea of an outflow into the A.C.—which experiment has not proved, and which seems from Leber's investigations to be rather improbable—we must then receive, as the probable condition of affairs, the explanations given under the second proposition.

B.—The second factor which can bring about the circulation of crystalloid bodies through the cornea is diffusion. The rapidity of diffusion depends upon the special quality of the diffusing body (the co-efficient of diffusion), and upon the difference of concentration; it increases as this difference between any two points increases; up to a certain point also concentration appears to increase the rapidity. One is therefore not justified from observations of the diffusibility of a substance, in coming to any conclusion as to the diffusibility of crystalloid bodies in general, or on the diffusibility of any body in particular under altered conditions of solution. If the substance is homogeneous and at rest, diffusion will take place in all directions with equal rapidity, and at two spots equi-distant from the diffusion centre the solution would be of equal concentration. But if new diffusive material is constantly being brought to the part and old material being removed, we have a diffusion current, and this diffusion current must be on no account

confused with the mechanical stream of which Gruber has been treating hitherto. A mechanical effect can never be brought about by a simple diffusion current. In a fluid at rest, no matter how active a diffusion current may be proceeding, a solid body suspended, such as a piece of cork, will remain absolutely still. If we have to do here with such a diffusion stream the current of exchange will be in lines running from points of greater saturation to less; the rapidity of diffusion will be greater the shorter the distance which separates such points. There is no doubt that such a process goes on in the cornea. If there be, then there must be diffusion into the aqueous humour all over Descemet's membrane, and the amount of it will be regulated by the removal from the A.C. on the one hand, and by the supply of new material on the other. There is a less saturation of the aqueous humour, and thus a negative pressure will be exerted there, assisting and bringing about the process of diffusion; thus a regular current will be maintained.

So far, Gruber goes on, we have assumed the process to be constant, and we have seen how it proceeds when once established; but what takes place when it is first put in operation by the introduction into the cornea of a new diffusible substance? At first the tendency will be towards the uniform diffusion current, but when the diffusible substance has been distributed through the cornea and into the aqueous, surely removal of it by the angle of the anterior chamber and a similarly uniform fresh supply will disclose the regular diffusion current, the laws for the regulation of which it is important to discover. Deviations from this uniformity may be brought about (*a*) by the influence of a current; (*b*) by irregularity of the paths. The diffusion process is not necessarily altered by a mechanical current, for if a quantity of an easily diffusible coloured substance be thrown into a stream in motion, the colouring material will distribute itself exactly as it would do in the same fluid at rest. But in virtue of the circulation, &c., we have to do with a more complicated problem. If the direction of the current happen to be also that from a

point of greater to one of less saturation, the distribution will be hastened ; if the contrary be true, it will be delayed, or may even be annulled.

Pflüger believes that in consequence of the current which sets from before backwards, the diffusion interchange which would occur in the opposite direction is completely abrogated. Gruber does not accept this view, but agrees that the process may be assisted by a suitable direction of the current. But as Leber has correctly pointed out, the conditions of the contents of the A.C. are not very favourable to free diffusion.

Much more difficult is the investigation of the second point, viz., in how far the want of uniformity of the cornea has the effect of modifying diffusion. It has been indicated that the greater the contrast the greater is the difference of concentration and rapidity of diffusion—facts which one sees illustrated on injecting ferrocyanide of potassium. As the diffusing substance passes from a better into a worse medium, a certain “congestion” occurs, from which congested area it begins to spread as from a centre, till a re-arrangement is gradually brought about. If when using ferrocyanide of potassium we find an area in the cornea more deeply tinted than surrounding parts, that is a sign that towards this spot a more active diffusion must have occurred, or that there was greater opposition to diffusion in the surrounding parts ; or lastly, it may be that the salt has been for some reason or other “fixed” in that situation. In virtue of this last circumstance, Gruber has been able to demonstrate the presence of the salt even when very dilute, and under conditions in which it had never before been proved.

C.—It is really the third factor in the corneal circulation, namely, the vital action of the tissue, which interposes the chief obstacle to the solution of this difficult problem. The question which one encounters at the outset is, whether the laws governing the diffusion of an inorganic salt through dead tissue are applicable, without modification, to the living cornea. From his own observations on the enucleated pig's eye, and from those of Laqueur on the person

of a newly-executed criminal, as well as from other considerations, Gruber thinks it certain that there is physical diffusion in the cornea, apart altogether from the vital action, but that it is equally true that this mechanical process is altered in some way by vital action. It is not easy to say which of the elements (cells, intercellular substances) plays the principal *rôle* in this action; it is certainly undeniable, as Leber showed, that the cells possess a very special selective power of selection of crystalloid bodies. But it is not safe to conclude, in the present state of our knowledge, that the cells alone are the active elements, still less safe is it to accept Knies's assertion that it is the parenchyma which performs this duty. In how far the mechanical process is altered by the vital action we do not exactly know, but from experiment it is obvious that the rapidity with which a crystalloid body is distributed through the cornea is very much greater in a living than in a dead eye. In the dead eye there is lacking, of course, the *vis a tergo*—the blood pressure—which must have some influence in the living in assisting the mechanical current; but this does not come into the problem when the substance is introduced into the conjunctival sac.

To sum up, Gruber concludes that the circulation of crystalloid, as distinguished from colloid, bodies is possible by virtue of the mechanical and diffusion currents themselves, without taking into account the vitality of the corneal tissue; but that during life the vital activity of the tissue has an influence on, takes part in, the process; and that it does not seem probable that we should have to adopt any very grave modification of the laws theoretically deduced in regard to the question.

These laws, as above stated, regarding the circulation of crystalloid bodies are, of course, true also of the circulation of fluid, but this is a very difficult investigation to follow out. Diffusion (not filtration) towards the A.C. is certainly possible, only it cannot occur to any very great degree in consequence of the peculiar circumstances of the aqueous humour. Whether a current running from without inwards and from behind forwards exists, is more than

questionable in regard to crystalloid bodies. Evaporation from the surface, acting by a sort of suction or negative pressure, and thus producing a current setting forwards, cannot be credited as having any effect, since the surface is kept moist during life by the action of the upper lid.

II. The Circulation of Colloid Substances.—The investigation of the mode of circulation of colloid substances through the cornea has this very particular point of importance—that the special nutrient material of the cornea, *i.e.*, the serum, belongs to this group.

Experiments have been conducted with certain of these substances, sometimes in solution, sometimes undissolved.

Stricker and Norris have observed a coloured colloid substance (undissolved) pass from a process of a cell into the body of the cell, through it, *via* another process into a new cell.

Szokalsky injected carmine into the blood, and found the cells of the cornea stained.

Brugsch was able, after injection of grains of cinnabar into the A.C., to find pigment in the posterior layers of the cornea, but none in the parenchyma or vessels (except immediately round the track of the needle).

Leber injected Prussian blue and found none in the cornea.

Baumgarten failed to find any cinnabar in the cornea after injecting it in suspension into the interior of the eye, the episcleral tissue and the A.C.

Knies experimented with starch, injecting it into the A.C. He found it deposited on the surface of the iris, taking on a blue colour with iodine, but none elsewhere in the eye. If a substance is discovered in the cornea which proves itself to be a grape sugar produced by the fermentation of starch, the observer will yet be uncertain whether it has arrived there by diffusion of a body in the A.C. which has become diffusible by the action of the aqueous humour, or by subsequent transition of a colloid body which has been deposited there. He has further found that if a starch solution be injected into the cornea and examined immediately thereafter, the blue colouration is easily obtained, both cells and fluid being tinted.

Gifford injected pigment into the angle of the A.C. and found that none penetrated Descemet's membrane, but a little was found near Fontana's spaces in the innermost layers of the cornea. On injection of Indian ink in suspension into the layers of the cornea, a little was carried sometimes towards the centre, sometimes towards the periphery, showing the very slight power of the ordinary lymph current.

Although Knies has not been able to draw any certain conclusions from his experiments, Gruber finds no proof that a substance which is not diffusible can pass into the corneal tissue. Knies conjectured that the starch passed into the cornea and was there altered into sugar; Gruber on the contrary believes that the transformation took place in the aqueous, and that sugar then diffused into the cornea. Knies's second experiment helps Gruber to this conclusion, for if after injection of a substance into the cornea one can only discover it in the immediate neighbourhood of the point of entrance, this says little for the circulation of the body; probably a transformation takes place as it passes through the cells, a process which, as above indicated, has been observed by Stricker and Norris.

The result of Gruber's own experiments has simply been to confirm those of Knies. Half an hour to an hour after injecting starch into the A.C. he could find none of it, while he could always find proof of the presence of grape sugar, especially near the point of entrance. At a shorter interval he could find starch in the aqueous, but not in the cornea. It seems, then, as if the change of starch into sugar came about in a very short time; with a more suitable substance we might arrive at an explanation of the question more easily. Theoretically the question in regard to colloid is simpler than that of crystalloid bodies, for there is no diffusion element to disturb.

We have already concluded, says Gruber, that a current for crystalloid, and indeed for colloid bodies, is only possible if we accept an exit forwards or backwards. We have seen from Leber's investigations that such an idea is not only not proved but is probably incorrect. If

we reject such a current we must accept Scheme 1, and say that it is exclusively the vital action of the cells which can bring about the circulation of colloid substances.

We are thus confined to accepting on theoretical grounds that process as chief agent in the nourishment of the cornea which Stricker and Norris had directly observed. We cannot tell whether it is due to the cells alone or to the parenchyma also.

III. The Nutrition of the Cornea.—The circulation of the nutrient material in the cornea offers a constant movement; that which is removed at one moment is immediately replaced by a fresh modicum. It will be seen from what has gone before that this removal is effected by the venous portion of the peripheral capillaries, without any exit into the anterior chamber. If we accept the lymph vessel system to be the vehicle of removal, we have to alter none of the mechanical and physiological relations. Theoretically we ought to distinguish between crystalloid and colloid substances, for the former can, the latter cannot, be distributed by diffusion, but the constant course of the current of circulation deprives this circumstance of much of its importance; the two varieties of substance are distributed together. This is, however, not so true of the peripheral parts where there is a real current, and which, therefore, are better nourished than the central, a fact which clinical experience verifies constantly in a variety of ways.

A few words finally are said as to the canal system of the cornea, which since its discovery by von Recklinghausen has been so frequently a subject of discussion, and which some believe to be in relation with the vascular, some with the lymph system. Some hold that the cells fill the spaces of it, others that there are spaces between cells. The question is asked, what is the significance of such a system in regard to the nourishment of the cornea? The explanations given above as to the course, &c., of the nutrient fluids are true whether there be such a system or no. If this system has no exit into the A.C. there can be no current through it except at the periphery; and we have seen that our supposition very probably

coincides with the facts. We have thus no motive force, no *vis a tergo*, which can set in motion this stream; we cannot regard capillarity as the agent of a steady circulation; diffusion will not act for the colloid substances, and we have seen that diffusion can do nothing towards setting up a mechanical current.

There remains nothing, then, but the vital action of the tissues which can set in motion the nutrient material in these canals; but this vital function of the living cells is a subject which must be left for further investigation.

W. G. SYM.

W. MANZ (Freiburg). On Medullated (opaque)¹ Nerve Fibres in the Human Retina. *Arch. of Ophthalm.*, xxix., 3 & 4, p. 221 (German Edition).

In three cases of medullated nerve fibres observed during life, Manz has been fortunate enough to obtain the eyes at *post-mortem* examinations within the last two years. The anatomical examination of these cases is particularly valuable, as Manz had been able to examine the eyes repeatedly.

With regard to the vision, the author mentions that he was unable to test the sight accurately, as all three individuals were of more or less imperfect mental development. He lays stress on this circumstance, which he considers to be of very common occurrence in individuals with medullated nerve fibres in the retina. But although

¹ The term "medullated" seems more appropriate than the term "opaque," as usually employed in England.—K.G.

vision could not be tested accurately, all the individuals performed their house work without any apparent difficulty.

The microscopic examination of the eyeballs gave results which differ in several respects from those of previous observers. Virchow, who was the first to examine an eye of this kind in pre-ophthalmoscopic times, found white patches in close proximity to the disc produced by nerve fibres with dark contour, that is, fibres with a medullary sheath. The fibres of the optic nerve showed no medullary sheath within the lamina cribrosa. The specimen, which had been hardened in chromic acid, showed also varicosities of the medullated nerve fibres; the transparent fibres, however, showed also in some parts spindle-shaped thickenings. In 1874, in a case diagnosed by the ophthalmoscope during lifetime, Schmidt-Rimpler verified Virchow's results as regards both the absence of the medullary sheath within the lamina cribrosa and the frequent occurrence of varicosities.

Of Manz's three cases, one had shown ophthalmoscopically the well-known white figure at the upper and lower margin of the disc, the second all round, and the third downwards only. Nothing else abnormal had been found except in the third case, where there were circumscribed corneal opacities, one fine synechial thread and beginning cortical opacity. The *post-mortem* examination gave no evidence as to any abnormal condition of brain or kidneys in any of the three cases.

The microscopic sections were stained either with osmic acid or with Kultschitzky's logwood mixture and eosin. With the latter method the following staining took place:—Sheath and connective tissue of optic nerve, sclerotic, and the fibres of the lamina dark red, choroid pale red, retina blue, varying in the different layers, the granular layers hardly stained at all. The nerve fibres of the optic nerve are stained blue; at the posterior opening of the scleral foramen the blue colour suddenly stops, but reappears beyond the lamina in a small number of nerve fibres of the retina, the majority remaining unstained. By far the greater number

but still not all, lose their blue stain when entering the lamina cribrosa. In some instances the staining goes on in the intra-laminal portion, and also begins in some fibres before they emerge at the optic disc. Within the retina the medullated fibres are found both in bundles and singly, mostly travelling in the same layer, *i.e.*, parallel to the surface of the retina. They are not only thicker than the transparent fibres, but also than those of the optic nerve, and show numerous varicosities of various size, mostly spindle-shaped and surrounding the fibre, but in some cases in a more lateral position. When highly magnified, these varicosities seem to consist of a thickening of the medullary sheath, the axis cylinder remaining unaltered. Staining with aniline blue and saffranine (after Stroebe) showed, however, most convincingly that these varicosities are actual thickenings of the axis cylinder, and not of the medullary sheath at all. It was further noticed that in sections of the eye stained by this method some medullated nerve fibres were seen in parts of the retina which had not shown any white patches ophthalmoscopically during life. Manz suggests the possibility of such nerve fibres occurring in thin layers in the retina without being recognisable with the ophthalmoscope.¹ Staining by Stroebe's method revealed further the continuance of the medullary sheath in some few fibres *right through the lamina cribrosa*, from the optic nerve into the retina.

In all the eyeballs examined another peculiar occurrence was noticed in the optic disc, and its close proximity, *viz.*, globular homogeneous hyaline formations of various size, the so-called corpora amylacea. Under a high power it was possible to make out that they were connected with a fine fibre, and in some cases with another fibre at the opposite side, and it was finally seen that these globules were varicosities of the fibres of the optic nerve. Staining with aniline blue revealed a thin medullary sheath, but there was no capsule recognisable nor any concentric stratification or other structure, except in some cases one

¹ Compare herewith Wagenmann (succeeding article).

or two highly refracting globular grains. The varicosities themselves appear to be exclusively altered axis cylinders.

Manz suggests that these probably degenerative changes of the axis cylinders may have some connection with the occurrence of the medullated nerve fibres of the retina. The varicosities cannot be considered as the result of a senile atrophy, one of the individuals being quite a young man. As for the occurrence of the medullated fibres, it seems most probable that they are a malformation, an anomaly of either foetal or intra-uterine development.

If we consider the globular varicosities mentioned as bearing on the existence of the medullated retinal nerve fibres, an extra-uterine formation would probably explain their occurrence, while an intra-uterine development would more easily explain the frequent co-existence of a somewhat malformed intellect, a more or less recognisable idiotic condition, in many of these cases.

K. G.

A. WAGENMANN (Jena). Disappearance of Medullated Nerve Fibres in the Retina, in consequence of Genuine Atrophy of the Optic Nerve in Locomotor Ataxy. *von Graefe's Arch.*, xl., 4, p. 256.

The case is that of a man aged 57, who complained of failing sight, especially in the right eye. When first observed the pupils did not react to light; the patellar reflexes were absent; visual field of right eye contracted; red-green blindness; a central scotoma existed for yellow; within this scotoma blue was only recognised faintly; the periphery was fully sensitive to both blue and yellow.

The left eye had a normal field; vision $\frac{1}{2}$; red-green blindness existed. The ophthalmoscope showed the right disc to be greyish white, the left pale but reddish; downwards and outwards a sector of medullated nerve-fibres adjoined the disc. Other symptoms were present to make the diagnosis of locomotor ataxy certain.

During the following months vision sank slowly while the ataxy progressed in a marked degree. Ten months after the first examination the patient could only walk with a stick. The right eye had only a small excentric visual field. The left had vision of $\frac{1}{10}$, field slightly contracted inwardly, no scotoma. Right disc greyish white; left disc greyish, inner half still reddish. *The medullated nerve fibres have disappeared.* Thirteen months later amaurosis in both eyes; both discs greyish white.

So much for the history of the case. The great disturbance of the colour perception, with comparatively good central vision and normal field, seems to indicate that the optic nerve had been affected right across at an early date. Wagenmann further points out that the central colour scotoma indicates a more active progress of the disease in the papillo-macular nerve fibres than in the rest of the optic nerve. In cases of optic atrophy from locomotor ataxy, both Leber and Berger have seen a central scotoma with an otherwise free visual field.

It is noteworthy that in the left eye the visual field became first affected in that part which corresponded to the region of distribution of the medullated nerve fibres. Vision was not totally destroyed there, only reduced, at a time when the complete disappearance of the medullated fibres had already been observed. From the fact that the disappearance of these fibres preceded by a long interval the complete loss of vision in the affected part, which retained a fair amount of function for some time, the author comes to the conclusion that the axis cylinders remained active after the medullary sheath had disappeared. This conclusion, as Wagenmann himself remarks, presupposes that only medullated nerve fibres originally existed in that part of the retina. From the observations in the paper by

Manz,¹ such a supposition seems, however, quite unproved, and the conclusion drawn by the author must be considered as merely hypothetical. The disappearance of the medullated fibres indicates, however, the process as it most likely occurs in the fibres of the optic nerve.

The origin of the optic atrophy in tabes and in progressive paralysis is by no means yet established beyond doubt. From Leber's investigations, which have been corroborated by subsequent workers, it appears that the genuine grey atrophy has its seat in the fibres of the optic nerve, and is a primary degeneration, while the neuritic processes are characterised by an inflammation of the interstitial and inter-fibrillary tissue, with secondary destruction of the nerve fibres. The former has been shown by Leber to be due to a change of the medullated fibre into a pale varicose fibre without medullary substance, and eventually into an indifferent fibre. This process may be going on in the whole optic nerve, or only in patches, and cannot therefore be considered as simply conducted along the nerve-fibres.

From the material hitherto examined it is not possible to say in which way the degenerative process spreads, and whether we have to deal with a primary progressing degeneration along the fibres, or with a secondary descending atrophy (Leber). Nor do we know with certainty the mode in which each single fibre is attacked—whether the medullary sheath or the axis cylinder is the first to be affected. In Wagenmann's case the disappearance of the medullated nerve fibres, while the function of the retina was still fairly well preserved, shows not only the spread of the disease into the intraocular part of the fibres at an early date, but it also disproves the supposition that the intraocular degeneration was the result of a descending atrophy, inasmuch as the conducting power of the fibres was still intact at that period. The early appearance of complete red-green blindness certainly denotes an affection of the optic nerve right across its transverse section.

¹ See preceding article.

Concerning the ætiology of the grey degeneration, we can only surmise that certain poisonous substances affect similarly the nerve centres and the optic nerve, the most frequent poison being the syphilitic virus acting both in locomotor ataxy and in progressive paralysis. According to Strümpell, the poisonous effect in locomotor ataxy may be brought about, not by the syphilitic virus itself, but by certain toxines produced by syphilis in a similar way to that in which we imagine the post-diphtheritic nerve affections are caused by a toxine produced by the diphtheritic process.

The question remains open whether locomotor ataxy may induce not only grey degeneration, but also atrophy of the optic nerve by neuritic processes. If Samelsohn's distinction of two forms of ataxic atrophy of the disc—a grey atrophy with shrinking of the disc, and a white atrophy with enlargement of the disc—can be maintained, the author's case belongs clearly to the former kind.

K. G.

NOYES (New York). *A Text-Book of Diseases of the Eye.* London: *H. K. Lewis*, 1894.

The second edition of Noyes' work is apparently smaller than its predecessor, but in reality contains some seventy pages more, the diminution in bulk being due to the thinner paper employed. This diminution is an advantage; the present volume is much more handy than the former. Five years have elapsed since the first edition appeared, and the book now before us is issued as a "second and revised" edition. The first edition was noticed at some

length in this Journal,¹ and the present notes will therefore be brief.

That the second is an improved edition we think every reader of the two books will admit; it contains much additional matter, both in the letterpress and in the illustrations. The latter have been increased in number by thirty-two, while several of the woodcuts in the first edition have been changed. The additions to which we would draw special attention are the following:— In Chapter VIII., on “The Cerebral Connections of the Motor Nerves of the Ocular Muscles”; in Chapter XVII., on “The Pathological Changes in Albuminuric Retinitis” (written by Dr. J. E. Weeks, who has also supplied three illustrations); in Chapter XVIII., on “The Deep Connections of the Optic Nerves,” on the “Arrangement of Fibres in the Optic Nerve,” with which a plate from Henschen’s monograph is given, and on “The Cerebral Centres of Vision.” These, and other additions, considerably enhance the value of the new volume.

We regret that the book has not been subjected to a more careful revision. As we pointed out in 1890, the literary style falls short of what we have some right to expect from a leading surgeon, and in this respect we notice but little improvement in the new edition. There are also numerous small errors scattered through the book (*e.g.*, the references to figures on pp. 762 and 763) which should not have been allowed to pass, and which, though not in themselves important, necessarily mar a treatise which in many respects is excellent.

The book is well printed, and the illustrations are, with few exceptions, very good. An index of authors has, in this edition, been added to the very full index of diseases.

¹ OPTHALMIC REVIEW, 1890, p. 223 *et seq.*

POSSANER (Vienna). On the Duration of Life after the Development of Albuminuric Retinitis. *Thesis, Zurich, 1894. Abstract in Annales d'Oculistique, November, 1894.*

Retinitis albuminurica, in connection with chronic renal disease, was noted in the Zurich clinics in 0.19 per cent. of 67,000 cases (not 1.9 per cent., as stated in the *Annales d'Oculist.*). In eighty cases the authoress was able to obtain a reliable after-history, but eight of this number have to be eliminated, the cause of death being accidental.

In the remaining seventy-two cases, the course and termination of the disease showed some difference, according to the sex and surroundings of the patient. Of thirty-nine cases from Professor Haab's private clinique, twenty-three (58.9 per cent.) died within two years of the diagnosis of the retinal disease, the mortality being 53.8 per cent. among females, and 61.5 per cent. among males. Five men and five women were still alive, at periods of two and a-quarter to six years for the men, and three and a-half to eleven years for the women, since the onset of retinitis.

Of thirty-three cases in the hospital clinique, all the males and 68.4 per cent. of the females died in less than two years. Four women were still living, one of whom had been under observation for six years. The age of the patients varied from 6 to 60 years, a large majority being over 40 years. Two cases were syphilitic; one lived three months, the other two and a-quarter years.

Nothing is mentioned in the abstract as to the number of cases (if any) in which the albuminuria was a complication of pregnancy.

The results of this research, the authoress thinks, indicate that the prognosis in these cases is not quite so unfavourable as the statistics of Miley, Stedman Bull and others seemed to show; the difference in the mortality among the two classes of patients is very noticeable. Patients in good social position and hygienic surround-

ings succumb much less rapidly than those who are poor, and in whom, as the writer suggests, alcoholism probably hastens the end.

J. B. L.

NIMIER and DESPAGNET (Paris). *Traité Élémentaire d'Ophthalmologie*. Paris: Félix Alcan, 1894.

The authors of this treatise devote three pages thereof to a preface in which they explain the origin and aim of their book. From these introductory remarks we extract the following:— “We have written especially for those who are beginners in the study of ophthalmology. At the same time, in extension of our original design, we have endeavoured to analyse the various theories recently advanced upon important questions in ophthalmology and the therapeutic methods in common use to-day in the majority of eye affections, so that we venture to hope we have provided some useful information for those of our colleagues who read our book. . . . The desire not to exceed the limits of one volume has induced us to suppress all that relates to history and bibliography. . . . We have devoted particular attention to the chapter on ‘Refraction,’ endeavouring to render its description practical, while omitting as far as possible the formulæ for which the student of medicine is ill-prepared by his earlier education. We have adopted a uniform plan for each part of the work. After a chapter on anatomy and physiology, we have passed to congenital anomalies, traumatic lesions, inflammations, atrophic changes and tumours. Each section terminates by a chapter upon the surgery of that portion of the organ under consideration.”

A preliminary chapter with which the authors begin their treatise contains a brief but clearly written account of the development of the eye, eyelids and lacrymal ap-

paratus, with a reference to the pineal eye, taken from Debierre's "Treatise on Elementary Anatomy." The book is divided into seventeen sections in the following order:— (1) eyelids; (2) conjunctiva; (3) cornea; (4) sclera; (5) iris; (6) choroid; (7) aqueous humour; (8) vitreous humour; (9) crystalline lens; (10) nervous visual apparatus; (11) retina; (12) optic nerve; (13) refraction and accommodation; (14) eyeball; (15) motor apparatus of the eye; (16) lacrymal apparatus; (17) orbit, and lastly, an appendix containing the Government regulations as to vision in the military and naval services in France. The length of this treatise, which extends to over 900 pages, precludes a detailed review in these columns. The above-mentioned headings will give an idea of its compass, and our notice of it must be brief and general. We congratulate the authors on having produced a valuable book containing a vast amount of information, and upon having written in a very clear and intelligible style, for which the student, as well as the reviewer, will be grateful. We think, however, that they have erred in judgment. In our opinion the book is far too large for beginners (for whom it is primarily intended), and, considering its size, is not nearly as wide in scope, or as thorough as more advanced students would desire. For example, the pathology of the eye is treated throughout in a most meagre and elementary way, and much of the operative treatment of disease is dismissed with too brief a description.

The illustrations, which are not very numerous for a book of this size, are generally good, but a number of those representing ophthalmoscopic appearances leave much to be desired. Several of the illustrations (*e.g.*, fig. 209) appear to us obvious copies of well-known plates in other publications, and yet no acknowledgment of this appears in the text.

The book is furnished with a fairly comprehensive index and a table of contents, the latter inconveniently placed at the end of the book, between the text and the index.

C. HESS and H. PRETORI (Prague). Quantitative Investigations into the Law which regulates Simultaneous Contrasts of Light and Shade. *von Graefe's Arch.*, xl. 4, p. 1.

The phenomena of contrast produced in the retina by two adjoining fields of different brightness are distinguished as those of simultaneous contrast when the eye remains fixed, and those of successive contrast when the eye is exposed consecutively to two fields of various brightness. An attempt to measure the apparent difference of light induced by contrast has been made already by Lehmann and by Ebbinghaus, but neither author took any precautions to keep the simultaneous contrast sufficiently separated from the consecutive, and their results are therefore not in harmony with each other. A further disadvantage of their methods was that in both cases it was not possible to change the intensities of light with sufficient rapidity and sufficient accuracy.

Both these objections were overcome by Hess and Pretori who, in their researches made at the physiological laboratory of Professor Hering in Prague, dealt with the phenomena of simultaneous contrast only, to the complete exclusion of the successive contrast. The results obtained by them differ considerably from those of the two previous workers.

The authors tried first to find out the changes of apparent brightness, if either the brightness of the disc or of the ground is changed. For this purpose it was necessary to construct an apparatus which permitted the lighting up within a wide range of measurable intensity, and independently of both the disc and the ground. The apparatus constructed specially for this purpose is fully described in the paper and illustrated by two sketches. It presented to the suitably placed eye of the observer a rectangular vertical white field divided by a very fine vertical mesial line into two equal squares. The centre of each square was perforated by a sharply defined small

square hole, behind which another white field was placed appearing to monocular examination as situated in the same plane. Each of the large squares and the small squares could be lighted up by various intensities of light. When all four fields were equally lighted, the small squares could not be distinguished at all on the larger squares, becoming unnoticeable in the same way as the oil spot on a photometer when lighted equally from front and back. The intensity of light was regulated for each of the four squares by a lamp moving on a sledge after the style of a Dubois-Reymond induction coil. The intensity could be varied from 1 to 5,000 units, the unit for the lamps used being equal to 0.12 "normal units" of Hefner-Alteneck.

The most convenient way of experimenting was found to be the following:—The left large field was illuminated by light of a certain intensity, and the small central square by light of a different intensity. When the large and small right fields were equally bright with those of the corresponding left fields, both large fields appeared alike, and also both small squares. By varying the intensity of light falling on the small right square the latter appeared different from the left small square; it could, however, be made to match the left small square again without changing its own light, but simply by contrast, viz., by modifying the light falling on the surrounding large right field.

A plate which accompanies the paper gives a series of curves representing the results obtained. These curves are produced by representing the voluntarily altered intensities which light up the small field, as abscissæ of a system to which the ordinates are given by the intensities of light required by the large surrounding field to bring the small fields up to an equal brightness, by the effect of contrast.

In connecting the various points of section, curves were obtained which were as nearly as possible *straight* lines.

[It was found by these experiments that it is easier to compare fields of an apparent medium intensity or brightness produced by contrast, with either very strong or very weak intensities, than very strong or weak intensities produced by contrast with medium intensities.]

The following simple law was found to prevail for the intensities used in the authors' experiments:—A small field surrounded by a field of different brightness shows an apparent brightness which depends partly on its own intensity and partly on the effect of contrast. This apparent intensity remains the same if in changing the illumination of both fields the relative difference, the proportion of the increase of the illumination of both fields, remains the same, and it is independent of the absolute amount of change of illumination of both fields. Once the abscissæ and ordinates for two such points of equal apparent brightness are determined (*i.e.*, the intensities for the small and large field) it is therefrom possible to find either by calculation or by construction all other proportions of illumination of both fields in which the small field will appear of equal brightness.

A series of experiments was made by a different method, which permitted a great variety in the form, the extent and the relative position of the holes through which the "small" fields were observed; the result, however, was exactly the same as in the original experiments showing the same regularity.

An experiment is further described *in extenso*, which had first been planned and carried out by Prof. Hering, and which is illustrated by a drawing. As it, however, does not admit of the measurement of the differences of brightness produced by the effect of contrast, its description need not be given here.

K. G.



OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

THURSDAY, DECEMBER 13, 1894.

D. ARGYLL ROBERTSON, M.D., F.R.S.E., President, in
the Chair.

Five Cases of Plastic Cellulitis of the Orbit.—Mr. George Lawson read this paper. In 4 of the cases there was no pus, and in 1 a little pus was formed towards the end of the illness, and escaped through one of the exploratory incisions which had been made into the orbit. Of the 5 cases 3 died, 1 required excision of the globe, and 1 recovered with impaired sight. The symptoms were pain in the orbit, œdema of the eyelids, and proptosis coming on shortly after the first symptoms, with increasing loss of sight; high temperature, from 101° to 107°. The symptoms rapidly increased in severity, the eyelids became purplish red, shining, and œdematous, and the upper lid tightly stretched over the protruding globe. There was pain in the orbit, varying in intensity. If the symptoms were not relieved by treatment, the patient became delirious, then comatose, and died. In none of the cases had the patient received any injury, nor in any was there a trace of syphilis. In 4 of the cases the cellulitis was confined to one orbit, and in 1 there was cellulitis of both orbits. Four were women, and one a young man. Mr. Lawson's impression was that those cases were due to septicæmia, but in three he was unable to trace whence the septic matter came. In Case III. the cellulitis of the orbit was preceded by acute tonsillitis, and to this was probably due the orbital cellulitis. In Case V. the patient was certainly suffering from pyæmia before the cellulitis of both orbits came on. She had a pyæmic rash on the face, high temperature, 103·4°, and pain in all her large joints; but the source from which the pyæmia origi-

nated could not be determined. Mr. Lawson said that in women he felt certain septicæmia occurred more often than was suspected from septic materials supplied from the vagino-uterine track; and he thought that some of the so-called rheumatisms, to which women were so much more prone than men, were really septicæmia, probably induced from this source.

Mr. Tweedy considered all such cases very grave. He had had a recovery in one case, seen by Mr. Lawson, which he attributed to a free division of the upper eyelid extending to the orbital margin; by this means the tension was greatly relieved, and the patient recovered. The swelling disappeared, and the movements of the eye, though at first very limited, eventually became free, and the sight almost normal. Since then he had had one other case in which he had made a similar free division of the upper lid; in this case there was complete recovery. In one of his cases there had been an operation on the lacrymal duct some time before, and in the other the nasal mucous membrane had been cauterised, and he attributed some importance to the fact of there having been a previous injury.

Mr. Hulke thought it a pity that there was no necropsy in these cases; it was a question whether the orbital cellulitis was primary or secondary to a thrombosis of the ophthalmic vein or cavernous sinus, or to a meningitis. He mentioned the case of a lady who had pyæmia after removal of her breast; there was thrombosis in the cavernous sinus and veins of the choroid. Some of the mild cases were the result of influenza or measles, and these mostly recovered.

Mr. Critchett had shown one case before the Society some years before; it was supposed to be due to retained molar teeth, and recovered after removal of the molars. He agreed with Mr. Tweedy that free division of the lid should be made.

Dr. Bronner had seen cellulitis of this kind after injury to the nose.

Hydatid Cyst of the Orbit.—Mr. Lawford read notes of this case. The patient, a girl aged 17, came to the hospital

in September complaining of pain in and around her right eye. There was moderate proptosis, with some displacement of the eyeball downwards and outwards; limitation of movement upwards, inwards, and to a less extent outwards; some œdema of lids and conjunctival congestion; $V. = \frac{6}{18}$; optic papilla much swollen; retinal veins dilated and tortuous; a few small retinal hæmorrhages. The symptoms had been noticed for two months. All the above-mentioned conditions increased during the next ten days, and the patient was taken into the hospital for operative treatment. A deeply-seated tense tumour could then be felt behind the trochlea of the superior oblique, but there was no fluctuation. The tumour was cut down upon, and an exploratory puncture made with a syringe; perfectly clear fluid was withdrawn, and the tumour then collapsed; a larger incision was made and the cyst walls seized with forceps, and a cyst about the size of a walnut easily withdrawn. The characters of the fluid were those of hydatid, but no hooklets, scolices, or daughter cysts could be found. The wound healed rapidly, and the displacement of the globe slowly gave way; its movement in every direction except inwards soon became normal, but probably from damage to the internal rectus during the operation the eye remained divergent. The swelling of the optic papilla quickly subsided, and vision was fully restored. Two months later there was no sign of recurrence of orbital growth. Mr. Lawford referred to the rarity of hydatids in the orbit, and advocated early interference in these cases, before sight has become irreparably damaged. The best plan, he thought, was to expose the tumour by dissection, then incise it, or draw off the fluid contents by a syringe or aspirator, and subsequently endeavour to remove the collapsed cyst through an incision enlarged sufficiently for this purpose.

The President had had a case of this kind seventeen years ago, which he treated by puncture and removal. He thought the defect of movement in Mr. Lawford's case

was due to an interference with the nerve supply rather than to accidental division of the internal rectus.

Mr. Rockliffe had had one case in which he had to excise the eye owing to the patient deferring the operation; the cyst was found to be suppurating.

Mr. Johnson Taylor had had a case in which there was a cyst at the upper part of the orbit; it was a question whether it was a meningocele or not. It was tapped, and the fluid not being meningeal, the cyst was removed.

Mr. Lawford, in reply, said there was some difficulty in distinguishing between a hydatid cyst and a meningocele, but it was always safe to tap the cyst and examine the fluid.

Osteoma of the Conjunctiva.—Mr. Hartridge read this paper. R. W., aged 3 months, was found to have a swelling at the outer part of the right eyeball, which was noticed three days after birth. It was diagnosed as a dermoid growth and was removed. It measured 12 by 6 millimetres, and consisted of a superficial soft part and a deep hard one, the latter being like an incisor tooth in form. On examination it was found to be bone covered by periosteum; in one part like an ivory exostosis, in another cancellous. It had not the proper structure of a tooth.

The President had had a case many years ago exactly similar in position and appearance to the one now recorded.

Formol as a hardening Agent.—Mr. Marshall read this paper. Formol was introduced by Professor Leber; it was supplied under two names—formol or formaline. A 10 per cent. aqueous solution of this was best suited for hardening purposes. If an eye was placed in this fluid for twenty-four hours it became perfectly hard, and could be cut easily; the eye retained its natural fresh appearance, the cornea and lens were transparent, the iris normal; blood and pus appeared unchanged, the vitreous was unaltered, and the retina and choroid remained *in situ*. There was no need to freeze the eye in order to cut it, as was necessary after hardening in Müller's fluid.

The President thought as a hardening agent it was almost perfect.

Mr. Juler had used it, and found it very satisfactory. In one case an eye had been put into a full strength solution by mistake, but it had not been harmed by it.

Mr. Lindsay Johnson had used it before Leber introduced it, but had given it up, as he thought some other agents were superior. Formol precipitated metallic silver from solutions of its salt; and, in this way, by precipitating silver in the tissues, it might be very useful.

Papillary Conjunctivitis.—Dr. Adolph Bronner (Bradford) read notes of a case of papillary conjunctivitis of the left eye due to the prolonged internal use of arsenic. The patient, a youth of 22, suffered from chronic eczema of the skin. In July he began to take arsenic, in pilules of one milligramme. For two months he had been taking twenty-four pilules daily; the eyes then became red and very irritable. There was a peculiar slight œdematous condition of the conjunctivæ and of the lids. Boric acid lotion and cocaine drops relieved the symptoms temporarily. In two weeks the patient returned. There were pinkish, small, hard, irregular papillary growths of conjunctiva and of the left upper lid, most marked at upper end of tarsus. In spite of the local application of sulphate of copper, the growths did not seem to diminish for fourteen days. The arsenic was then discontinued, and, under treatment, the growths subsided greatly. The use of arsenic frequently gave rise to conjunctivitis, but there were no cases on record in which papillary growths had formed.

The President thought it very problematical that the arsenic was the cause of the papillary growths; if it had been so they would probably have come in both eyes.

Card Specimens.—Mr. Lang: A case of Cataract with Crystals in the Lens, with Microscopic Specimens. Mr. H. Work Dodd: (1) A New Pince-nez; (2) A case of Congenital Lens Opacity.—Dr. Bronner (1) Wire Shield for use after Cataract Operations; (2) Benno's Writing Paper

with Raised Lines for the use of the Blind.—Mr. G. Lindsay Johnson : (1) Removal of Lenses in a case of Myopia ; (2) Symmetrical Markings in a case of Lamellar Cataract.—Mr. N. C. Ridley : A case of Congenital Coloboma in the Macular Region.—Mr. W. J. Cant : Large Sarcomatous Tumour on the Right Side of the Brain.—Mr. Donald Gunn : Case of Tuberculous Iritis.

S. E. HENSCHEN (Upsala). Contributions, Clinical and Anatomical, to the Study of Cerebral Pathology. *Part 3, first half.*

In the May, 1893, number of this Review there appeared a brief notice of parts 1 and 2 of Henschen's *opus magnum*, and we have now before us the first instalment of part 3. It, like its forerunners, is calculated to inspire its readers with a feeling of security in the author's methods as reliable, and in the conclusions he draws as reasonable. It displays the same marvellous and painstaking industry, the same care in recording clinical facts, in forming clinical diagnosis, in conducting *post-mortem* examinations, both macroscopic and microscopic, in comparing the clinical diagnosis with the *post-mortem* appearances, in pointing out the lessons to be learned from each case, and in systematising them for future use. Errors in diagnosis, *i.e.*, a want of accord between the clinical diagnosis—it may be in some detail only—and the *post-mortem* appearances, when they occur, are candidly recorded, and attention drawn to them, even though they may jeopardise some more than half-formed view of the author. In this work hypothesis assumes insignificant dimensions, and no conclusion is drawn except in so far as it seems to the author to be justified by the clinical and pathological facts of the case. But if anyone dissent from Henschen's deductions, he will, in reading his pages, be in almost as favourable a position as was the author to form his own conclusions, so complete are the descriptions in the letter-press, and so graphic and obviously true to nature the illustrations. If any criticism other than favourable were to be offered, it would be that the style is somewhat

diffuse, and that there is perhaps some unnecessary repetition.

The present fasciculus consists mainly of the records of eight additional cases observed by the author, which bear on the question of the position of the visual centre, and the course of the visual path. But there is much incidental matter concerned with other burning questions of cerebral physiology, and, indeed, this whole work of Henschen's is one of great value and importance, not alone to ophthalmology but also to neurology, medicine and surgery. The final chapter is a dissertation on the hemiopic pupil symptom. This appeared some little time previously as a separate publication, and has been noticed at length in the December number (1894) of this Review. It will, therefore, be unnecessary to refer to it here.

The following is a brief *résumé* of the cases recorded, in so far as they are of interest to ophthalmologists.

CASE I. — Although unable to be ascertained during life, owing to the patient's obstinacy, there must in this case have been absolute left homonymous hemianopsia due to the complete destruction of the optic radiations in the right hemisphere which was found after death, and which was the result of softening from thrombosis. But as the patient could read up to at least a few days before death, the macular centre in the left hemisphere was, it may be concluded, healthy. Yet there was disease of the apex of the left occipital lobe, both on its lateral and mesial aspects. The case seems, therefore, to point to the macular centre being situated not in the apex of the occipital lobe (posterior portion of the calcarine fissure), but rather some 2 cm. to 4 cm. more forwards, where no disease was present. At the same time the author admits that our present knowledge does not allow us to say with certainty whether some slight microscopical disturbances of nutrition found, as here, in the cortex are, or are not, capable of causing a disturbance of function.

CASE II.—This was a case of partial left hemiplegia and left homonymous hemianopsia, with ptosis of the right upper lid (crossed paralysis). There was left hemianæ-

thesia, which was more marked than the hemiplegia. After death there was found a small patch of softening in the posterior third of the posterior limb of the right internal capsule, which might be taken to account for the hemiplegia and hemianæsthesia, and, according to an old view, for the hemianopsia. But there was extensive softening on the mesial surface of the right occipital lobe, and softening in the right external geniculate body, either of which lesions might have caused the hemianopsia. The latter lesion renders the cortical disease useless as affording any additional evidence in respect of the position of the visual centre. In Henschen's experience the mesial surface of the occipital lobe and the external geniculate body often become diseased together—a circumstance to be explained by the arterial supply of the latter being derived from the posterior cerebral artery. The disease in the external geniculate body in such cases may be only microscopic.

A small patch of softening in the grey matter of the aqueduct of Sylvius explained the paralysis of the right levator palpebræ. This lesion involved also the nucleus of the left fourth nerve, of which the trunk was found to be completely atrophied, although no corresponding symptom had been observed during life.

The case is one of those which affords valuable arguments in connection with the hemiopic pupil symptom.

CASE III.—In this case there was an error in the diagnosis in so far as the nature of the lesion was concerned. The symptoms were:—Right hemiplegia, amnesic aphasia, word-deafness, paraphasia, agraphia, word-blindness, and right homonymous hemianopsia. There was occasional headache, but no nausea, and no optic neuritis. There was right facial paralysis, and there were occasional tremors or twitchings in the right arm and leg. Athetoma of the vessels and dilatation of the heart were noted.

The chronic course of the disease, the gradual development of the symptoms and the increasing dulness of the mind, with the occasional headaches and twitchings in the right arm and leg, spoke for a cerebral tumour.

But the headache was slight, and the twitchings rare and transitory, never approaching to an epileptic attack. Moreover, even to the end there was no optic neuritis. Hence the author did not feel himself justified in making the diagnosis of an intra-cranial tumour, and looked on the symptoms as probably due to a slowly progressive cortical encephalomalacy—a diagnosis which was favoured by the atheromatous vessels, the cardiac dilatation, and a history of alcoholic abuse. The *post-mortem* displayed an extensive cerebral tumour.

The localisation of the disease had been correctly made during life. It occupied the surface of the central, temporal and parietal convolutions. The hemianopsia was caused by the total destruction of the occipital convolutions, to which the growth extended.

CASE IV.—Here, after an apoplectic attack, the prominent symptoms were: right hemiplegia with aphasia, and right homonymous hemianopsia, without hemiopic pupil. There was congestion of the papilla. A gumma in the left parietal region was diagnosed, and after death a gumma was found occupying the posterior part of the second temporal convolution, and involving, to some extent, the neighbouring part of the third temporal convolution, and passing upwards towards the angular gyrus. There were, as is usual with syphilitic tumours, only slight appearances of pressure in the convolutions. Gummata tend to destroy or supplant the cerebral substance rather than to push it aside.

As regards the diagnosis which was made of the locality of the disease in the brain, the author says: "In this respect the diagnosis, thanks to the presence of the aphasia, was fairly accurate. Several harmonising symptoms existed. In the first place, as regards the right homonymous hemianopsia; the growth involved, as I believed, the visual path, and the absence of a hemiopic pupil re-action placed the lesion beyond the external geniculate body. Then the sensory aphasia, word-deafness, as well as word-blindness, and the hemiplegia, or rather as it was, hemiparesis, pointed to a tumour which

involved the auditory word-centre in the temporal lobe, and the visual word-centre in the angular gyrus, producing the hemiparesis as a distant symptom. I admit I had localised the tumour somewhat higher than it was found after death." "Word-blindness" the author says, "is usually held to indicate a lesion in the angular gyrus. Yet neither the meaning of the term word-blindness, nor how this symptom comes to pass, has been clearly defined: and hence the boundaries of the centre have not been finally laid down. In some cases the lesion producing the symptom lay in the boundary between the parietal and occipital lobes, as for instance in a case of mine (No. 28, part 1) which is one of the purest hitherto published; and again, word-blindness seems sometimes to occur as the result of word-deafness, with the lesion in the temporal lobe."

CASE V.—In this case the patient died suddenly on the day of her admission to hospital, before either the history or the symptoms could be carefully noted. After death an extensive gummatous tumour was found at the base of the brain, and it is pointed out as unusual in basal tumours that, as here, there should be no congestion papilla. This is all the more remarkable in this case, as the growth had evidently pressed upon the corpora quadrigemina, and must have, more or less, occluded the Sylvian aqueduct.

The *post-mortem* appearances leave no doubt that owing to destruction of the right geniculate body by the tumour, left homonymous hemianopsia was present during life. The hemianopic pupil reaction could only once be sought for, and was not found. This circumstance would afford evidence opposed to the view of the author, in regard to the path for the pupil-reflex.

CASE VI.—The patient was 80 years of age. The diseased state found after death consisted in multiple thrombi of the cerebral vessels producing small disseminated softenings, especially of the cortex, in nearly all parts. The initial, and for many months the only, symptoms were attacks of vertigo—associated, doubtless, with the formation of fresh thrombi—and a dull and peculiar

sensation in the head. Later on there was slight hemiplegia, the mental faculties became duller, and the patient died comatose.

Of ophthalmological interest was a peripheral contraction of each field of vision, without hemianopsia or ophthalmoscopic appearances. The author thinks this contraction may have been due to a small symmetrical patch of softening, which was present in the apex of each occipital lobe, and which, he believes, interfered with the functions of the posterior part of each calcarine fissure, where previous cases have inclined him to think the cortical centres for the peripheral portions of the fields are placed. The entire cortical surface of the left cuneus had undergone softening, but as there was no hemianopsia the case affords additional evidence that that region is not the centre for vision.

The peripheral contraction of the fields in this case may have been due to the cause which Henschen inclines to assign to it. Yet there is another explanation of the symptom here which the author does not discuss, and which seems to recommend itself by preference as being more to hand than the one he offers. It is that this contraction was merely part of the expression of the general cerebral depression due to diminished blood-supply and imperfect nutrition. We find similar peripheral contractions in many cases of recent focal cerebral disease, especially with tumours and abscesses, without any lesion in the visual centre or path; and they occur sometimes in patients who are debilitated from exhausting general diseases, and even in general debility without any definite disease, and also after epileptic attacks. In hemianopsia, too, we often meet with a peripheral contraction of the seeing half fields, especially with extensive lesions, even if only one hemisphere. The contraction is probably due to functional inertia of the visual centre or of the retina itself, comparable, although not quite similar, to that present in neurasthenia, and known as fatigue of the retina.

CASE VII.—Left hemiplegia and hemianæsthesia (but

no facial palsy), and left hemianopsia. Complete loss of power of motion of the eyeballs except towards the right. Hemiopic pupil reaction. Atheroma of the cerebral vessels, thrombosis, softening. "The complete and sudden paralysis, as also the complete hemianæsthesia and hemianopsia, pointed to a central seat for the cerebral disease, of which the extent could not be more definitely stated, as we have no differentiating symptom for a lesion in the central ganglia. But the partial immobility of the eyeballs spoke for a derangement of the nuclei of the orbital nerves."

After death the corona radiata of the right hemisphere was found to be almost destroyed, all connection between the cortex and the central ganglia being cut off, as well as that with the left hemisphere.

As in this case, and also in Case I., the right hemisphere must have been rendered useless for all psychological processes, while the left hemisphere was practically healthy, and the mental faculties in each patient were good, it may be concluded that the left hemisphere suffices for the psychological processes.

The left homonymous hemianopsia was explained by extensive disease which was present both in the right external geniculate body and in the optic radiations.

For the restrictive motion of the eyeballs no satisfactory explanation was obtained from the examination of the brain.

CASE VIII.—An apoplectic attack followed by complete left hemiplegia and hemianæsthesia, with diminished sensation in the right side of the face. Death after sixteen years. Hæmorrhagic cyst in the right thalamus and posterior limb of the right internal capsule. Secondary degeneration in the fillet and pyramidal tract. The brief period of unconsciousness following the attack spoke for a small hæmorrhage, and for a locality where the equilibrium of the disturbed intracranial pressure would soon become restored. The optic thalamus answers to this requirement. The hemiplegia, accompanied with almost complete hemianæsthesia, pointed to a lesion of the internal capsule.

There was no hemianopsia, although the posterior third of the posterior limb of the internal capsule was completely destroyed. Consequently, Henschen concludes, no visual fibres pass through the internal capsule, and this conforms to the author's previously expressed views on this point. But as hæmorrhage in the internal capsule is sometimes accompanied by hemianopsia, it remains to be ascertained, the author says, under what conditions this coincidence occurs, and especially, whether the hemianopsia in those cases is transient or permanent.

“The question of the relation of derangements of vision to lesions of this part of the internal capsule has not yet been satisfactorily decided, and is still one of those most discussed in the wide range of questions concerned in defects of vision caused by cerebral lesions. For a long time Charcot's school held that certain lesions of the internal capsule were attended by disturbances of vision, and they proposed the theory of the ‘*amblyopie croisée*,’ which led to the hypothesis of a double crossing of the optic fibres, and to the assumption of two distinct cortical centres, one for bilateral, the other for monolateral vision. The grounds on which these hypotheses were founded were in the main purely clinical observations—the coincidence of a cerebral lesion with ‘*amblyopie croisée*’ which was usually accompanied by anæsthesia of the corresponding eyeball and eyelids, or side of the body. This theory was supported by few anatomical facts, six cases in all, which Féré incorporated in his work, ‘*Troubles fonctionnels de la Vision*.’ In these cases a lesion was found at or near the posterior part of the posterior limb of the internal capsule. Thomsen and Oppenheim also put some cases on record in which there was a coincidence of this amblyopia and anæsthesia. But the theory of ‘*amblyopie croisée*’ is still surrounded with uncertainty, and it is therefore important to publish every well-observed case which may serve to throw light upon the matter.” It is to be regretted that the kind of visual defect which was immediately caused by the apoplectic attack in this particular case cannot be stated with certainty, but, so far as could be learned, it

was not different from that which had been present for some months before death. This consisted in a distinct, although not very extensive concentric contraction of each field, somewhat larger in the left than in the right field. It is true that there were some ophthalmoscopic changes about the macula in the left eye, and some incipient cataract in the right eye, which the author thinks can hardly have had to do with the contraction of the field, by reduction of the acuteness of vision. But it seems to the author probable that the contraction of the field can best be regarded as the result of the changes in the internal capsule.

The frontal section of the thalamus was completely severed from all connection with the pulvinar, the geniculate bodies, and the corpora quadrigemina. The dorso-occipital portion of the thalamus was destroyed. It may therefore be concluded that the optic thalamus receives no visual fibres.

The dorsal portion of the pulvinar was destroyed, as also the central portion to the level of the ganglion habenulæ, hence disease of neither of these regions can cause hemianopsia. The ventral portion remained healthy, and the case, therefore, affords no evidence as to the use it may serve in vision.

H. R. SWANZY.

MITVALSKY (Prague). A Study of the Bony Tumours of the Orbital Region. *Arch. d'Ophthal.*, Oct., 1894.

(Continued from vol. xiii., p. 397.)

Case II.—J. H., a labourer, 30 years old, received a kick in the region of the left eye, in consequence of which the lids and eye-ball were ecchymosed for a long time. Patient affirms that prominence of the left upper lid began at this time (1887). At first there was no active inflammation in the lid, but later on it became the seat of repeated attacks of redness, swelling and severe pain. No diplopia. As the pain began to radiate to the head, patient consulted Mitvalsky. His general appearance was healthy; nasal fossæ patent, left orbital region protruded, upper lid red and swollen (especially in lower third) and drooping. A bony tumour occupied the middle two-thirds of the superior orbital margin, projecting downwards and forwards. The globe was displaced 1.5 cm. forwards, 1.2 downwards, and 0.3 inwards. Movements normal, outwards and inwards, but restricted downwards and especially upwards. Tumour very sensitive to touch. The area of the left frontal sinus 0.4 cm. more prominent than on the other side. Diagnosis: osteoma of the left frontal sinus, which had atrophied the supero-internal wall of the orbit, and spread into the orbit.

Operation in June, 1891.—Access to the tumour was gained through an incision over the upper and inner margin of the orbit. An easily detached layer of soft red connective tissue covered the tumour. The growth was white, of ivory hardness, and followed the orbital margin. The transition to normal tissue was marked not only by the change in colour of the bone, but also by the reappearance of normal periosteum. The tumour had spread nearly to the optic foramen. Lying free in the orbital tissue was a blue opalescent jelly-like substance, 1.5 cm.

long, 1.2 thick, and 0.8 wide, resembling a piece of echinococcus membrane, and of the consistency of half-dried gelatine. Near the lacrymal gland there was a pedunculated tumour as large as a hazel nut, the pedicle of which was attached at the point where the osteoma joined the normal orbital wall. It was of cystic appearance, bluish-black, and of a soft elastic consistence. While being examined with the finger it suddenly filled with blood. Evidently this was a mucous polypus from the mucous membrane of the frontal sinus, which had been dislocated thus far by the growing tumour.

Fearing lest the tumour had already spread too far to permit of a radical operation, Mitvalsky decided to remove the part in the orbit only, and succeeded in getting away a considerable portion of it. After cleansing the wound the globe was replaced, and the levator palpebrarum re-attached. An intense exudative inflammation followed; the exophthalmos was exceedingly marked. After several days the inflammation became purulent, with all the symptoms of orbital abscess. On this account the already cicatrised outer angle of the lid wound was reopened, and a quantity of pus and tissue-*débris* escaped. A week later the discharge had ceased, but the chemotic sac which had formed on the upper part of the conjunctiva was so persistent that it had to be cut off. The globe resumed its normal position, and has retained it up to the present time; slight ptosis is still present. Two years and a-half after the operation no growth had been noticed in the tumour, nor had a fistula established itself.

The histological structure of the polypus found at the outer end of the osteoma was the same as that of the polypi formerly described. The formation found free in the orbital tissue proved a detached mucous polypus, with tissues somewhat denser than that of the other polypi. The succulent tissue enveloping the osteoma represents, as in Case I., the union of the periosteum whence the tumour arose, with the remainder of the hypertrophied polypoid mucous membrane of the frontal sinus. Here and there in the periosteal layer are trabeculæ of bone due

to the deposition of lime salts. The mucous layer presents signs of chronic inflammation; the epithelium is, for the most part, absent, and in the furrows only can *débris* of cylindrical epithelium be found.

In his review of these cases, Mitvalsky pronounces Arnold's theory of the origin of such tumours from residual foetal cartilages "a mere hypothesis, without a single anatomical examination to support it." He thinks that the periosteum of the orbital bones which have become atrophied owing to the presence of the tumour, atrophies also, as he could not find a trace of it.

Against the discouraging statistics of Berlin (6 deaths in 16 cases) in operations on tumours which had invaded the roof of the orbit, Mitvalsky cites these two cases. He also cites Bornhaupt, who, although asserting that the statistics are even more unfavourable than represented by Berlin (7 deaths in 11 cases), recommends a radical operation, not to prevent disfigurement, but to avert death consequent upon future brain trouble.

Contrary to other authors, Mitvalsky thinks the operation may be undertaken at any time, as long as the brain and its envelopes do not show serious pathological changes. With Panas he thinks that resection of the tumour has the effect of arresting, or greatly retarding, its growth by removing the connective tissue envelope from which it derives its nourishment.

II. A Case of Multiple Hyperostosis of the Orbital Bones, complicated with Formation of Cartilage in the external Rectus Muscle and in the Periosteum.

A woman, 65 years old, who had always been healthy, and showed no signs of hereditary disease, had toothache and frontal neuralgia, with prominence of the left eye, and diplopia six weeks before entering the hospital. A surgeon had already incised the chemosed conjunctiva.

The writer found the patient in good general health; right eye normal, the left eye prominent, ptosis of the upper lid, which was swollen and red. Conjunctiva not much changed; displacement of globe 1.5 cm. forwards, 1.4 downwards, and 0.2 outwards. Movements upwards

and outwards completely abolished, in other directions much restricted. Fundus normal, except for marked hyperæmia of the disc and retina. $V. = \frac{6}{60}$. The orbital margin was extremely sensitive, and there were also supra- and infra-orbital painful spots, so that digital examination was impossible. Mitvalsky at first thought of sarcoma.

The globe was excised, and then it was found that the roof of the orbit was thickened by a rough hyperostosis, to which the superior muscles were adherent. On the inner wall was a similar hyperostosis extending from the optic foramen to within 2 cm. of the orbital margin, but entirely distinct from the hyperostosis of the roof, and bearing on the most anterior point of its periosteum a button of fibro-hyaline cartilage of the size of a flax-seed.

The outer wall of the orbit presented a similar condition of thickening, and adherent to it was a hard, almost chondromatous tumour, which proved to be the external rectus, and was removed. The hyperostosis could not be removed. The patient was kept under observation for several months, during which time the hyperostosis continued to increase, and the pain remained. Then the author lost sight of her.

The anterior free end of the external rectus presents the picture of chronic interstitial myositis. Further back the outer half is the most changed—in fact it is represented by lymphatic cells only. Where the tumour adheres to the hyperostosis a few degenerated muscular fibres are found, widely separated by masses of lymphatic cells. Along the vessels and nerve fibre bundles, wide rows of round cells are seen passing from the outer to the inner half of the muscles. The arterial walls are unchanged, but the vein walls are thickened by lymphatic infiltration, the endothelium swollen and relaxed. The nerve sheaths and intra-fibrillar tissue is infiltrated and swollen; the fixed connective tissue cells are enlarged. Further back we find the lymphatic cells assuming the forms of degeneration, and the connective tissue giving way to a dense substance formed at the expense of the round cells, in which *débris* of muscular fibres, obliterated vessels, and connective

tissue fibrils are found. Mitvalsky thinks this is the chondrification of the inflammatory products of the interstitial myositis. This cartilaginous zone is separated from the hyperostosis by a thick layer of connective tissue fibres furnished by the muscle sheath and the periosteum.

Still a little further back the tumour shows two cartilaginous nuclei. The lower of these soon changes to a rich-celled tissue, resembling embryonic or sarcomatous tissue, and containing giant cells. The upper nucleus presents calcareous infiltration, but nowhere is ossification found.

Mitvalsky does not, for this case at least, accept Rokitansky's theory that bony neoplasms are bony transformations of enchondromata, but believes that the hyperostosis gave rise to inflammatory changes in the muscles, the products of which underwent cartilaginous transformation.

The inflammation of the nerves explains the pain and its continuance after the operation. The pain described by older authors in cases of exostosis is ascribed to the pressure on the nerves in the bony canals; this case proves, so our author thinks, that the pain may also be due to neuritis, and perineuritis accompanying osseous formations.

The writer believes that syphilis may be wholly excluded from the etiology of osteomata of the orbit. The difference between osteomata and the bony plates formed by sclerosing syphilitic periostitis is too great to excuse any error in diagnosis.

M. W. FREDRICK.

J. REBOUD. The Position of Rest of the Eyes.
Archives d'Ophthalmologie, Nov., 1894.

In this paper, Reboud, who is a French army-surgeon, records a series of experiments on the latent equilibrium of the eyes in distant vision. As is well known in this country, the "position of rest" is quite another question, since it is taking too much for granted to assume that the eyes during sleep, or during mental abstraction in darkness, assume the same position as that to which they tend when actively engaged in looking, even when only one eye is used, at a distant object. Reboud is quite alive to the distinction, and only employs the term because Stilling's theory is expressed in it. He says, "we only really find the eye in the position of absolute rest in obedience to the simple elasticity of the muscles and aponeuroses, in physiological sleep, in profound narcosis, and perhaps in that sleep of the eyes—complete blindness." Reboud's experiments were nearly all on young soldiers, whose eyes are but little engaged with near objects and form an interesting contrast to the students and reading men on whom previous investigations have been chiefly made. The apparatus employed was Snellen's, which consists of a well-closed black chest, lighted within, and provided on the side facing the observer, which is about $2\frac{1}{2}$ ft. long, with twenty parallel apertures, each 5 cm. high by 1 cm. broad, and separated from each other by 3 cm.; these apertures are covered with a red glass. Below and in the middle of the series is a single fixed aperture of the same dimensions covered with a green glass. In Snellen's own chest the green aperture is movable, but Reboud prefers it fixed. Add to this instrument a trial-frame with two loose glasses, one red, the other green, and a dark room 6 metres long, and his outfit is complete. He speaks of the great difficulty of getting red and green glasses to neutralise each other, yet unless they do so completely the test is vitiated. The patient is led into the dark room

with the spectacles on and both eyes covered with the observer's hands, and is placed in a chair 6 metres from the chest. One eye is uncovered and sees the series of red apertures, the other the green aperture. If with both eyes open the green aperture appears in the middle of the red series, the visual axes are assumed to be parallel. It is assumed that the eye which sees the green aperture has more tendency to accommodate for it than the eye which sees the series of red apertures has to accommodate for them. No reason is given for assuming this, and yet some of the chief conclusions are argued from it. Were the green aperture provided with letters to be read, the assumption would be fully warranted; as it is, the aperture is of the same shape as the rest, and it would be well to know why the eyes should necessarily accommodate for it in preference to the rest, simply because it is in the singular and they are in the plural. The results in emmetropia show that when the eyes have the same equilibrium, they have in general a nearly similar visual acuity. When vision is good, the least good eye has the most tendency to converge, or the least tendency to diverge, but when vision is poor, the least good eye has a tendency to divergence, for emancipation. Of ninety-two emmetropic eyes, 40 per cent. showed parallelism, 22 per cent. were convergent, and 45 per cent. divergent; while in 35 per cent. the equilibrium differs when the spectacle glasses are transposed.

Of 90 feebly myopic eyes (under 3D.) with correction, 17 per cent. were parallel, 56 per cent. convergent, and 26 per cent. divergent, while 29 per cent. differed on transposing the spectacle glasses. Of forty-four moderately myopic eyes (3 to 5D.) 24 per cent. were parallel, 39 per cent. convergent, and 36 per cent. divergent. Of twenty-two highly myopic eyes 35 per cent. were parallel, 40 per cent. convergent, and 25 per cent. divergent. In hypermetropia 30 per cent. were parallel, 53 per cent. convergent, and 16 per cent. divergent. Hypermetropic astigmatism showed a preponderance of divergence, and myopic astigmatism a preponderance of convergence.

The final conclusions are :—

Monocular Vision.—(1) The tests acquaint us with the physiological habit of each eye rather than its position of rest. (2) Convergence is the rule for every eye having good vision, and a clear image by the aid of accommodative effort (surmountable obstacles). (3) Parallelism and divergence, parallelism especially, represent the majority (61 per cent.) of the positions of rest. It is that of eyes which have not to accommodate to have clear vision, or which, having to make too constant or laborious an effort, have renounced it, or cannot make it by reason of insurmountable obstacles (irregular astigmatism, nebulæ, opacities, choroiditis, optic atrophy).

Binocular vision.—(1) An equal acuity of the two eyes is the best security of their association, the surest guarantee of binocular vision. (2) Astigmatism not only makes the acuity poor, but it is, next to anisometropia, the greatest adversary to binocular vision. (3) Hypermetropic astigmatism, even with a good acuity, does not favour convergence. It differs, therefore, essentially in this respect from the hypermetropic eye.

The author has handled the subject well, and there is much that is suggestive in his paper.

ERNEST E. MADDOX.



TH. AXENFELD (Marburg). Purulent Metastatic Ophthalmitis. *von Graefe's Archiv*, xl., 3, p. 1, and 4, p. 103.

The above paper takes up 225 pages of *Graefe's Archives*, and the following are the author's conclusions :—

Purulent metastatic ophthalmitis occurring in all varieties of pyæmia is in about one-third of the cases a complication of ulcerative endocarditis. The frequency of endocarditis is probably one of the causes of the unusual frequency of ophthalmitis in puerperal fever, as endocarditis has a certain causal connection with ophthalmitis, especially with the bilateral cases. It occurs in 50 per cent. of the bilateral cases, and only 21·7 per cent of the unilateral cases.

In the puerperal and surgical cases there is nearly always extensive inflammation at the place of infection, usually purulent thrombo-phlebitis. These cases are instances of secondary pyæmia. The cryptogenetic cases are instances of primary pyæmia.

The ophthalmitis is in about one-third of the cases bilateral, and when this occurs the prognosis is extremely grave. If the case is a puerperal one, it is almost certainly fatal, and in the other forms life is in imminent danger.

Unilateral ophthalmitis (except, perhaps, in puerperal cases) may occur in mild attacks of pyæmia; more especially is this the case in cryptogenetic pyæmia, and in pyæmia due to pulmonary or meningeal disease.

The bilateral ophthalmitis is usually the only metastasis to be found in the carotid circulation, and, therefore, it cannot be the result of any large embolic masses, but must be due to minutely divided septic material, which by reason of the smallness of the retinal (and in part of choroidal) capillaries, or of some other uncertain causes, takes up its position in the eyeballs.

That the small capillaries are the vessels implicated is shown by the majority of the ophthalmoscopic and anatomical investigations which have been published. Clinical experience points in the same direction, for, although the complete or partial blindness is always rapid in developing, it is almost never sudden, as in embolism of larger arteries.

The proclivity of the retinal capillaries for septic embolism may in part be accounted for by their smallness, but probably other circumstances have to be taken into account, such as vascular derangements induced by septicæmia (*e.g.*, thrombosis, endothelial degeneration, simple septic hæmorrhage), or even mere senile degeneration, all of which may assist in localising the lesion in the retina.

Unilateral, and exceptionally even bilateral, ophthalmitis is often the only metastasis detected in mild cases of pyæmia, and if it occurs simultaneously with the general symptoms in a cryptogenetic case it simulates a spontaneous ophthalmitis. In puerperal cases the streptococcus pyogenes is the principal pathogenic microbe; in the surgical cases the staphylococci are also found.

The pneumococcus of Fraenkel and Weichselbaum is found in the cases due to internal diseases, and usually produces phthisis bulbi without actual panophthalmitis, as is noticed especially in the cases due to epidemic cerebro-spinal meningitis. In the latter disease the pneumococci may fill up the lymph spaces of the optic nerves right up to the sclerotic without actually entering the eyeball, and it has not as yet been proved that suppurative ophthalmitis can originate in this route. The embolic origin of the ophthalmitis in meningeal cases has, however, been demonstrated, although we cannot assume it as proved in a given case unless the blood is found infected.

In meningitis due to pneumococci the microbes can invade the orbit through the fissure orbitalis superior without intervention of the veins. Care must be taken not to confound *post-mortem* agglomerations of intra-vascular microbes with actual septic emboli, and it must be remembered that the origin of the suppuration may be rendered perfectly obscure shortly after its outbreak, so that the absence of

intra-vascular microbes is no proof that the suppuration is not endogenous.

Pathogenic micro-organisms in the blood do not pass through the vascular walls except when the latter have been rendered pervious for them by pathological changes, such as metastatic inflammation, &c.

The term "metastatic choroiditis" is to be rejected for metastatic ophthalmitis, as in many cases it is the retina which is primarily affected.

The paper, of which the above is the summing-up, is divided into several sections:—

(1) Ophthalmitis in puerperal fever, of which 63 cases are tabulated, 41 lateral, and 22 bilateral. All of the latter, when the disease broke out approximately simultaneously in the two eyes (17 cases), were fatal. Of the unilateral cases one-half survived. In 55 per cent. of the fatal cases examined for endocarditis this condition was present.

(2) Ophthalmitis in surgical pyæmia, viz., after operation and injuries and local suppuration of various kinds. Of this, 46 cases are tabulated, more than one-third of whom survived. The mortality in the bilateral cases was, however, 78·6 per cent. These 46 cases are all cases of secondary pyæmia; an undoubted case of primary traumatic pyæmia with metastatic ophthalmitis has not been recorded.

(3) Ophthalmitis in infectious diseases is postponed for discussion in a future communication.

(4) Ophthalmitis in cryptogenetic pyæmia. Of this 27 cases are tabulated, 12 bilateral and 15 unilateral. Of the former, 83·3 per cent. were fatal, of the latter 33·3 per cent. Endocarditis was present in 83·3 per cent. of the cases when it was looked for *post-mortem*.

(5) Ophthalmitis in lung disease. Of this, 18 cases are tabulated, 6 bilateral and 12 unilateral. In 2 cases the microbe detected was staphylococcus pyogenes aureus, in 1, streptococcus, and in 1, pneumococcus.

Many pages are devoted to discussing the causation of the ophthalmitis which occurs in cerebro-spinal meningitis.

Is it due to an infection of the blood, *i.e.*, a metastatic inflammation, or to direct transmission by the spaces in the nerve sheaths? Axenfeld records one case of meningitis when the blood was infected, and pneumococci were found in the nerve sheath, as well as a capillary embolism in the retina. In another case of cerebro-spinal meningitis with purulent ophthalmitis, ulcerative endocarditis was present, and the ocular lesion was found to have originated in the retina. It appears probable that the ophthalmitis is due to metastasis.

The second portion of the paper is divided into four sections. The first treats of the evidence in favour of endogenous infection afforded by intravascular micro-organisms. This is less important than would be *à priori* supposed, for undoubted cases of endogenous inflammation have been observed without microbes being found either in the vessels, or even in the tissues which were first affected by the metastatic inflammation.

The second section deals with the subject of *post-mortem* increase of intravascular micro-organisms, which complicates the microscopical examination of these cases.

The third section treats of the nature and origin of the true septic metastasis, and the fourth of the changes in the vascular cells.

A valuable list of the literature of the subject is given at the end of the paper, and excellent plates illustrating the pathological appearances in some of the cases observed by the author.

J. B. S.

L. de WECKER (Paris). The Treatment of Wounds of the Cornea by Conjunctival Occlusion. *Annales d'Oculistique*, November, 1894.

At the last International Congress, Snellen advocated the employment of a conjunctival flap in wounds or incisions of the cornea and sclera, which flap should be made to cover the wound and be retained in this position by sutures. This method is easily applicable when the wound is in the sclera at some little distance from the cornea; less available when the wound is close to, or at, the corneal margin. In cases in which the wound is in the central part of the cornea, the difficulty of covering and keeping it covered by a conjunctival flap is considerable.

Even if two flaps be made on opposite sides of the cornea and joined medially by sutures, the traction is sufficient to make the stitches cut their way out before the conjunctiva can have become united to the wound, or the wound have healed beneath the conjunctiva.

The writer thinks he has found a means of coping successfully with this difficulty by making, temporarily, a complete conjunctival covering to the cornea. He employs this proceeding only in cases of large wounds reaching to or extending beyond the corneal limbus, and showing a tendency to gape more or less widely.

The method recommended is as follows. The conjunctiva and sub-conjunctival tissue are carefully divided all round, and close to the margin of the cornea. The conjunctiva is then separated from the deeper tissues almost as far as the insertions of the recti muscles, and when thus freed from its attachments, is drawn over the cornea and stitched, either by a continuous suture (*suture en bourse*), which brings the cut margins together like the drawing-string at the mouth of a bag, or by four or six separate sutures. Care should be taken that the stitches are passed through the subconjunctival tissue, in order that they may not cut out prematurely; the cornea is thus

covered in its entirety by conjunctiva. The edges of the eyelids and the cilia having been carefully cleansed, a dressing and bandage are applied, and allowed to remain undisturbed for eight or ten days, until the suture threads have become spontaneously detached.

In the author's experience there has been no case in which the adhesion of the conjunctiva to the cornea was more extensive than was desirable. It has always left unaffected the part of the cornea which had not been wounded, its adhesion to the cornea being limited to a narrow area adjoining the lips of the wound.

By this treatment de Wecker maintains that it is possible to save eyes which have sustained very large wounds of the cornea, if the operation is performed (under general anæsthesia) very soon after the accident; time should not be taken to deal with deeper lesions, such as wound or dislocation of the lens, which can be better treated after the subconjunctival healing of the corneal wound has taken place.

The operation, the writer adds, is very easily performed, and leaves no visible scar.

J. B. L.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

THURSDAY, JANUARY 31, 1895.

D. ARGYLL ROBERTSON, M.D., F.R.S.E., President, in the
Chair.

Two Cases of Diphtheritic Conjunctivitis treated by Klein's Antitoxin.—Mr. W. H. Jessop read this paper. The first case was that of a boy, 19 months old, who had membrane on the upper and lower palpebral conjunctiva of the left eye, and a patch of membrane on the left side of the uvula; one lymphatic gland over the parotid was enlarged, and there was albumen in the urine. Three injections of Klein's antitoxin were given, $1\frac{1}{2}$ drachms in all; the membrane disappeared in five days, and was not followed by conjunctivitis or other conjunctival change. There was no local treatment except distilled water. The second case was that of a male child, 8 months old. There was membrane on the palpebral conjunctiva of both eyes; the parotid glands were enlarged; there was a muco-purulent discharge from the nose. Two injections of Klein's antitoxin, 1 drachm in all, were given, but there was no local treatment. The membrane disappeared in four days. Dr. Hayward examined the membrane in both cases, and found large quantities of Loeffler's bacillus. The cases were interesting from their rarity and from their being the first published ones treated by antitoxin. The membrane was well marked in both cases, and only affected the palpebral conjunctiva. The complete and rapid disappearance of the membrane must be attributed to the antitoxin, as there were no other cases on record which have been so quickly and completely cured.

The President asked whether there were any subsequent paralytic affections.

Dr. Habershon asked for the dates of appearance of the membrane and of the injections, as it was said to be useless to inject antitoxin more than forty-eight hours after the appearance of the membrane.

Mr. Mackinlay had had a case lately which he had treated by Mr. Tweedy's method—quinine internally and externally; it had recovered, but not so quickly as Mr. Jessop's.

In reply, Mr. Jessop said it was too soon yet for paralytic symptoms to appear; it was uncertain how long the membrane had been present, as the history was not very definite on that point. He had used the injections as soon as he saw the cases.

Removal of the Lens in High Myopia with a Case of — 25 D. —Mr. C. Wray read this paper. He thought that the operation was not applicable in the case of children with less than 10 D., or in adults with less than 12 D. of myopia. The objects of the operations were three in number: (a) to prevent detached retina; (b) to arrest or prevent retino-choroidal changes; and (c) to enable patients with the highest grades of myopia to work at reading distance. He presented statistics of myopia of 123 patients with 246 eyes; thirty-eight cases, including three cases of detached retina, had V. less than $\frac{6}{36}$ in one eye, while ten had V. less than $\frac{6}{36}$ in both eyes. His figures, he considered, admitted of three deductions: that the vision was invariably less in the fourth decade than in the third; that retinal detachment is less to be feared than the changes in the retina and choroid, and that it is not necessary to regard every myope of 12 D. and upwards as hopelessly drifting towards detached retina and blindness. He had seen a case of retinal detachment after the removal of a lens in a case of myopia of 30 D., and considered detachment comparatively frequent after operation. The author did not agree with Parinaud in considering the operation a failure, because in Parinaud's case the removal of the lens was not followed by prevention of myopia, and considered the operation was a success if it prevented progressive change in the fundus, and enabled patients to work at reading distance when

otherwise unable to do so. He pointed out that in myopia of low degree, associated with zonular cataract, the crescent is at times out of all proportion to the amount of myopia, the presumption being that this is due to amblyopia, and on this conviction it was a common thing to remove zonular cataract when the patients could see $\frac{6}{24}$ and J. 4. He regretted that hospital reports do not furnish the subsequent history of these cases. After a reference to amblyopia with zonular cataract, it was pointed out that myopes of over 10 D. very seldom see more than $\frac{6}{18}$, and in the fourth decade $\frac{6}{24}$, and the question arose, should this amblyopia be regarded as a reason for operation, seeing that some of the results, especially those of Pflüger, Schirmer, Thier, von Hippel, and Fukala have been extremely brilliant, although the results vary between very wide limits as in other cases of extraction of the lens. With regard to the influence of the operation in preventing destructive changes in the choroid and retina, the only case that would appear to bear upon the point is Meyer's, in which, after the removal of a lamellar cataract from a myope, the fundus changes are said to have progressed, and, judging from the statistics at Mr. Wray's disposal, more rapidly than they would have done in all probability in the natural course of events. The point on which there is unanimity is that the patients were able to work much better after the operation, and some were enabled to follow vocations which had previously been impossible. If, however, vision—as appears to be the case—is practically certain to get worse, it would seem wise not to wait until the nutrition of the macula has been seriously impaired. Floating opacities in the vitreous, especially if in any number, would probably negative operation, whilst diminished tension should certainly do so.

Mr. Spencer Watson said he should hesitate to remove a clear lens in a case of myopia; he did not see why removing the lens should stop the progress of myopia. He had removed the lens in a highly myopic eye, but it was cataractous. There must always be the danger of a fluid vitreous.

Mr. Marshall had seen two cases of removal of the lens for high myopia. The result hardly recommended the operation; in one detachment of the retina followed, in the other the eye suppurated.

Mr. Hodges had one case which was not yet completed.

Mr. Rockliffe had had one case in which acute iritis followed the operation.

Mr. Doayne thought it possible that the amblyopia might be increased by the operation.

Mr. Lang had operated in one case in which $V. = \frac{6}{36}$; after needling, vision rose to $\frac{6}{12}$, with a simple cylinder. The case did well for a time, but after some months the retina became detached; the retina of the other eye was also detached. His experience was unfavourable; in two out of five cases there had been detachment of the retina.

Mr. Wray, in reply, said he brought the case forward to discover the opinion of the Society. That opinion seemed unfavourable; it was less favourable than that of many continental surgeons who had performed this operation.

Eyesight and the Public Services.—Dr. Mackay (Edinburgh) read this paper. His object was to express an acknowledgment and to elicit an opinion. The acknowledgment was that the recognition of the importance of good eyesight in the public services was due to the action of members of this Society. The opinion to be elicited was whether the visual examinations were conducted in a satisfactory manner. In 1863 Professor Longmore devised the now familiar army dot test card; in 1886 a Committee of this Society drew up the existing rules which were accepted by the Government of India, and subsequently by the War Office; finally, a pamphlet was issued in the same year by Sir Joseph Fayrer, and Mr. Macnamara, which supplied an indispensable *vade mecum* to ophthalmic specialists, and was an invaluable guide to occupation to many of the educated youth of the country. Coming to present facts, it would be found that there was a great difference between the method of fixing the standard

recommended by this Society and that generally regarded as sufficient by laymen or those not engaged in ophthalmic practice. The chief difference is that an estimation of the refraction of the eye is included in one and not in the other. The result of this is that some candidates for the services may be passed with a latent error so great that in later life their vision without glasses may fall below the standard, and they may have difficulty in continuing their duty. This neglect of refraction is costly to the employer and a cause of hardship to the employed. The condemnation of the visual examinations for the public services, as at present carried out, involves the exclusion of lay examiners for this duty. The present opportunity of bringing the subject forward was taken because the employment of lay examiners of vision for mariners and on railways was to be made one of the subjects of representation by a deputation of ophthalmic surgeons to the President of the Board of Trade. The deputation had been organised by the Committee of the British Medical Association for promoting the efficient examination of railway servants' and mariners' eyesight.

Mr. Doyne had found that the published instructions as to testing of vision for the army were of no value whatever; they would be good if they were carried out, but the standard was not adhered to. The test for the army was far easier than that given in the book.

Mr. McHardy said that for the Royal Navy candidates must have full normal acuity of vision, no latitude whatever being allowed. He thought that there was great hardship in testing vision without regard to the refraction in overworked boys with temporary spasm of the accommodation. On the other hand, candidates with much hypermetropia might be accepted and become useless after some years. The examination should be made by experts, and should include an estimation of the refraction.

Fleet-Surgeon Preston said that in the navy two standards of vision were in use; for the executive, including the fighting element and engineers, full normal vision was required in ordinary daylight, while for the civil

element, including surgeons, chaplains and paymasters, much more latitude was allowed. Full normal vision meant every letter in the test types; two or three in a line were not accepted. Each eye was tested separately throughout the examination. Cases of hypermetropia and astigmatism were rejected. Colour vision was tested by coloured bunting, Holmgren's wools, and tinted glasses. The estimation of refraction meant the employment of specialists, and this meant extra cost.

Mr. Bickerton said there were people in the navy who had defective sight and defective colour vision. He instanced the case of the *Vanguard*, which was run into and lost in consequence of her slackening speed, because the lookout man with defective sight gave notice of a vessel ahead seen by no one else.

Mr. Priestley Smith said that the test should be $\frac{6}{6}$, according to Snellen, and in a good constant light. The pamphlet required candidates to be emmetropic, yet refraction was not tested.

Mr. Critchett cited the case of a candidate rejected after failing to pass the test at twenty minutes past three on a dull November afternoon after his sight had been found normal by Messrs. Macnamara, Lawson and himself.

The following resolutions were proposed by Dr. Stephen Mackenzie, and carried :—

“(1) That in the opinion of this Society no examination of eyesight is complete or satisfactory which depends mainly upon an examination of the form vision by means of test types and dots, and omits consideration of the refraction of the eye.

“(2) That this Society hereby appoint the President of the Society (Dr. Argyll Robertson), Mr. Power, Mr. Nettleship, Mr. Lawson, Mr. Couper, Dr. Brailey and Mr. Hartridge to accompany the deputation of the British Medical Association to the Board of Trade on February 1 at 3 p.m. to give expression to the foregoing resolution.”

Card Specimens.—The following were shown: Messrs. Hodge and Ridley: Intraocular Melanotic Sarcoma with Peculiar Characteristics.—Mr. Lawford: Unusual Ar-

rangement of the Retinal Vessels.—Dr. Argyll Robertson : A specimen of *Filaria Loa*.—Mr. Marcus Gunn : (1) Peculiar Lenticular Changes following Old Injury of Eyeball ; (2) Prolonged Hypermetropic Congestion of Optic Discs closely simulating Papillitis.—Mr. E. Clarke : A Case of Pulsating Exophthalmos.—Dr. J. Hayward : Microscopical Specimens and Cultivations of Loeffler's Bacillus.

SIMPLE OPTICAL NOTES.

BY ERNEST E. MADDOX, EDINBURGH.

(1) A TEST FOR CONCAVE LENSES.—To select the neutralising lens from the ordinary trial-case is the best proceeding known to us when we wish to find the focal length of a lens. All errors are thus avoided, except a very slight one to be mentioned later on in Section 2. Next in value comes the Geneva lens measure, the portability of which almost compensates for its one defect of not being quite true for pebble lenses. In the absence however of these helps, as for instance when away from home, we have in the case of convex lenses to fall back on the time-honoured plan of measuring the focal length with a foot-rule or tape measure, after throwing on a screen the image of some remote source of light. It has long been felt to be a source of great inconvenience that this method is only applicable to convex lenses, and does not come to our aid with concave ones, unless indeed we can obtain a stronger convex lens and measure the focal length of the combination. The usual proceeding, I think, is to take for granted that a concave lens cannot be measured in the absence of a convex one, and at the most a rough guess is hazarded by noticing the thickness of the edges, and the apparent diminution of objects viewed through it.

It may be useful to some readers therefore, to mention that it is almost as easy to measure a concave lens by

reflection as a convex one by refraction. All that is required is to throw on a card or envelope held almost between the illumination and the lens an image of the source of light, which need not be distant more than two or three yards, since the error which springs from reckoning a finite distance to be a practically infinite one is four times smaller by reflection than by refraction. By measuring the distance between the lens and the envelope when the former throws the clearest image on the latter we obtain the focal length of the concave mirror furnished by the surface of the lens. Since, however, lenses are often ground differently on their two sides, we must test each separately, just as we do with the Geneva lens measure. We need only remember that the focal length of each surface *by refraction* is four times its focal length *by reflection*, since the focal length of a mirror is half its radius, and that of a plano-concave lens is twice its radius. Suppose, for instance, we find that one surface of a lens forms its reflected image at three inches, then the focal distance of that surface *by refraction* is twelve inches, which divided into forty gives the number of dioptries. Instead, however, of multiplying by four and dividing into forty, we might at once divide into ten, and make the following simple rule:—For each surface obtain the dioptries by dividing the number ten by the distance in inches of the focus by reflection. For concave *cylinders* it is just as easy, and the same rules hold.

If, answering to a dioptre, we were to appoint the “catoptre” as a reflective unit for spherical and cylindrical mirrors, it should represent a focal length of one metre, and a concave transparent surface would be of four catoptries for each dioptre.

(2) MENISCI OF ONE CURVATURE.—Many must have noticed that when the stronger plus and minus lenses of the trial-case are placed in opposition they do not

completely neutralise each other when their dioptric marking is equal. Take for instance $+ 20D.$ and $- 20D.$ When a lateral movement is imparted to the combined lenses, an object viewed through them appears to move in the opposite direction, so that the effect appears like that of a weak convex lens, and this is true whichever lens is nearest the eye. The explanation of this can be made extremely simple. It is of course due to the fact that the thickness of the lenses is too great to be neglected, and well-known optical formulæ would solve the question. But laying formulæ aside, let us merely consider the fact that, since the two surfaces in apposition mutually neutralise each other, we have only to do with the two free surfaces of the combination, one concave and the other convex, and both of equal curvature. Let us imagine the two free surfaces prolonged into infinitely thin hollow spheres: these spheres will be of equal size, and since their centres do not coincide they will intersect each other so as to include between themselves a space in the shape of a meniscus, in the middle of which space the combined lenses lie. If the reader has any difficulty in grasping the idea, let him describe two circles, each with a radius of two inches around centres separated by three-eighths of an inch. He will then perceive at a glance how the meniscus is formed, and see a section of it represented in its actual size and shape for lenses of $+ 20D.$ and $- 20D.$ I conclude therefore that the combination behaves like a meniscus, the surfaces of which are equally curved. Such menisci resemble convex lenses in making objects appear to move "against" them, but differ from them in other important particulars, notably in their spherical aberration and in the difference observed when different surfaces are placed next the eye.

(3) IMAGES BY INTERNAL REFLECTION.—When a flame is viewed through a weak spherical lens, an

image of the flame by double internal reflection is visible, and has long been known by the name of the "ghost" to opticians, who have used it sometimes to see if a lens is truly centred. When the image appears to coincide with the flame the eye is looking exactly through the optical centre of the lens. With cylindrical lenses the image by internal reflection is of a different appearance, being elongated, and with a high cylinder appears as a delicate straight line which affords a delicate test as to whether any prismatic element has crept into the cylinder. I only mention it because I am not aware if attention has been directed to it. An axial section of a cylinder should of course display perfectly parallel edges; if they are not parallel they will exert a prismatic effect. The straight line of light referred to affords a most delicate index, passing through the flame if there be no prismatic elements, or to one or other side of it if such elements exist. It is satisfactory to observe that all the cylinders I have tested appear to be manufactured with remarkable accuracy in this respect, the prismatic element being quite trifling. In the case of prisms, I found that the images by double internal reflection (which were first brought to my notice by Mr. Adams Frost), afford the most accurate of all tests for finding the apex of a prism. On looking at a flame through a prism, an imaginary straight line joining the flame, and the image of it which is formed by double internal reflection, is absolutely parallel to the base-apex line.

(4) TO DESCRIBE THE MERIDIAN OF LEAST AMETROPIA.—In retinoscopy we almost instantaneously form a pretty exact idea of the meridian of least ametropia, but how are we to express to our own minds, or those of others, what is the inclination of the meridian? If we guess the number of degrees we may be considerably out, and even if not, we may convey

a wrong impression to a student whose mind is confused with the different modes of marking trial-frames. I have found it so advantageous to use a description which cannot be mistaken, that perhaps others may also find it of service. The plan consists in utilising the features in the median line of the body. Thus I would speak of a crown-slant, chin-slant, brow-slant, mouth-slant, &c., always meaning the middle point of the specified feature. As soon as the preliminary survey is over, and the trial-frame is adjusted, there is no more need for such merely approximate descriptions, but, rightly used, they are sufficiently handy to deserve mention. It may be remarked in this connection that the most correct of the present methods of making a trial-frame is that which places the zero at the nasal side of each arc. This arrangement falls in with nature, for the great majority of astigmatic eyes are approximately symmetrical, with symmetry of a kind which is at once expressed by a trial-frame so marked.

A much better plan in one respect, since adapted also for the study of torsion, would be to have the zero in the middle of each arc, with the figures mounting up on each side of zero to 90° . A cylinder with axis vertical would thus be at zero, just as the vertical meridian of the retina is at zero in the primary position of the eyes.

Moreover, by this method parallel axes, whatever their obliquity, would have equal readings, no less than axes which are symmetrically inclined to the median plane. No other method with which I am acquainted combines more than one of the three advantages possessed by this.

(5) ABERRATION OF THE EYE.—This name suggests itself as a convenient expression to my mind for the want of coincidence between the two great axes of the eye, the axis of vision and the axis of the globe, the former being the functional axis, and the latter the

geometrical axis. A factor of such practical importance in the production of apparent squint must be expressed in some way, and in *clinical* work it is advisable to avoid such debatable and mathematical terms as the angles alpha and gamma. The angle alpha has indeed been shown to have no real existence, since the cornea, not being, as formerly believed, an ellipsoid of revolution, has no strict major axis. The experiments of Sulzer show this conclusively, and indicate that while the surface of the cornea in the vicinity of the visual axis is practically spherical, the more peripheral portions are generally unsymmetrical on opposite sides. For scientific work, the name angle gamma can be retained, as meaning the angle between the line of fixation and the axis of the globe, but since it obliges us to make the distinction between the axis of vision and the line of fixation, students are apt to get confused and shun a study about which they feel uncertain. This accounts in part for the very slight attention which the subject has hitherto received clinically. The confusion has been increased by the fact that Donders called by the name of alpha an angle which others call gamma, and in this country Donders has hitherto been followed, except by a few. Imagine a telescope so constructed that in order to see a star it had to be directed 5° away from the star; the possessor would no doubt speak of the aberration of his telescope, and make due allowance for it in all his calculations. Similarly with the normal human eye, in order to bring an object into the line of vision, the axis of the globe has to be diverted outwards 5° from the direction of that object. Without, therefore, defining any mathematical angle, we may speak clinically of "eyes of high aberration" and "eyes of low aberration," the former occurring nearly always in hypermetropes, the latter in myopes. "Eyes of normal aberration" are not often far removed from emmetropia, while "negative aberration" is only rarely met with, and almost always

in myopia of high degree. These facts, familiar to the reader, are only mentioned to show how to describe them in the terms proposed. Spherical aberration and chromatic aberration are not, strictly speaking, aberrations of the eye itself, but of the light in traversing its media, and need not be confused with aberration of *the eye*. It was the "aberration of the *rays* of light" which was spoken of in the early descriptions of spherical aberration, and only later and secondarily was the term used for "spherical aberration of a *lens*." Since vision is the one great function of the eye, aberration of the eye would, of course, have reference to its line of vision, and carry the thought, which is quite a true one, that we do not see straight out of our eyes, but obliquely out of them. In the clinical study of high and low aberrations of the eye, the value of ophthalmoscopic corneal images, first introduced by Mr. Priestley Smith for the measurement of strabismus,¹ has been elsewhere referred to by himself and the writer. *Fixation of the centre of the mirror* by the patient is essential, and daylight succeeds as well as artificial light if the patient's back be three-quarters turned to the window.

Let us now ask, what is the exact information which we gain from the corneal image? We have seen that the cornea in the neighbourhood of the visual axis is practically spherical, and it is only this part of the cornea which can reflect light into the observer's eye. Imagine, therefore, a straight line proceeding from the central aperture of the ophthalmoscopic mirror to the centre of curvature of this spherical portion of the cornea: in this line the corneal image will lie, and we may call it for brevity, *the line of the corneal image*. Does this line of the corneal image coincide with the visual axis? Not quite; for both of the two nodal points of the eye lie anterior to the centre of the corneal curvature. The

¹ OPHTHALMIC REVIEW, vol. vii., p. 349.

nodal points have, of course, no real existence, and are only close approximations to the truth. A ray of light which enters the eye as if proceeding *to* the anterior nodal point, emerges from the crystalline lens as if proceeding *from* the posterior nodal point, the former being about 6.96 mm., and the latter 7.32 mm., behind the anterior surface of the cornea; during positive accommodation they both become moved a little forwards, the anterior rather more so than the posterior, but the movement, even in near vision, is not so much as half a millimetre. The radius of curvature of the spherical portion of the cornea is about 7.8 mm., so that the apparent position of the corneal image on the cornea is slightly further removed from the optic axis than is the corneal transit of the visual axis. On the other hand, the "line of fixation" which connects the point of fixation with the centre of motion of the eye (13.5 mm. behind the cornea), traverses the cornea still further away from the optic axis. The angle between this line and the optic axis gives us the angle gamma. Let us briefly review the four lines we have considered. The *optic axis*, or the axis of the globe, connects the two poles of the eyeball, and, therefore, passes through the centre of the corneal circumference. In, or close to it, lie all the centres of curvature, the principal, nodal, and focal points. The remaining three lines are the *visual axis*, the *line of the corneal image*, and the *axis of fixation*; they all proceed from the centre of the mirror of the ophthalmoscope and arrive, respectively, at the fovea, the centre of curvature of the cornea, and the centre of rotation of the eye. The line of the corneal image, therefore, traverses the cornea somewhere between the visual axis and the axis of fixation. If we think of the aberration of the eye in connection with the visual axis, or in connection with the axis of fixation, the corneal image gives us no certain information about either. But if we think of the aberration of the eye as a general term

which supposes the axis of vision and fixation to be reckoned as practically one, then the apparent eccentricity of the corneal image affords us a reliable index of the amount of aberration. What I have said applies only to the unaided clinical use of the ophthalmoscope, and not to perimeters and ophthalmometers for more exact determination.

When the ophthalmoscopic corneal image occupies the anterior pole of the eye, or in other words, when it appears to lie in the centre of the corneal circumference, there is no aberration ; the further it lies from the anterior pole, the greater the aberration. A very little practice enables us to learn the normal aberration in emmetropia, and to detect any departure from it in the way of deficit or excess. I have mentioned elsewhere that a high aberration in an apparently emmetropic eye affords an indication for suspecting latent hypermetropia. In eyes of equal refraction, symmetry of aberration is almost always the rule. Corneal images are of much value in deciding whether a complaint of monocular blindness is real or feigned ; if real there will be generally sufficient asymmetry of the corneal images to prove the presence of a slight squint. The nature of apparent squint is at once cleared up by noting the aberration of each eye.

A CASE OF LENTICONUS POSTERIOR.

BY WILLIAM GEORGE SYM, M.D., F.R.C.S.E.

WRITING on the subject of lenticonus posterior in 1891, Knapp expressed the somewhat equivocal opinion that the condition was "not so very rare," but cases are for all that very seldom met with, and a few brief notes of one which I had the opportunity of seeing lately may not be uninteresting.

Mrs. B., aged 52, believes that her left eye has been defective as compared with the right all her life, but the first time she complained of her sight was twenty-five years ago. At this time she consulted two oculists. She had just before been over-exerting herself at laundry work, lifting heavy weights, &c., and evidently was suffering from advancing myopia with choroidal changes, as well as epistaxis and other general disorders. Shortly thereafter, having left her work, and her condition of health improving, she consulted a third oculist who ordered concave glasses. For the last few years, and especially for the last twelvemonth, her sight has been deteriorating, she believes; she has not been wearing her spectacles.

The patient is a thin but healthy-looking woman, who has had five children, all of whom she nursed; she has also had three miscarriages. Six years ago, with great benefit to her health, a gynæcologist removed a "polypus of the womb," which by hæmorrhages, &c., had been causing much trouble. Among her numerous relatives, no case of defective sight is known.

Vision—L.E. = fingers at 5 inches; with —15D. = fingers at 7 feet; J. 9 with much difficulty. R.E. with —9D. = $\frac{20}{40}$; with —6D. J. 1 fluently. A considerable staphyloma posticum, but no abnormality of the lens or other parts.

When examined by diffuse daylight with dilated pupil, the grayish reflection from the lens, so often observed in elderly persons, is very obvious, but in Mrs. B.'s case this reflex is confined to the central area of the lens—a circle of 4 or 5 mm. in diameter. Outside this disc there is none of the smoky appearance, the pupil being clear and black. This aspect is rendered more evident when examination is conducted with the aid of a concave mirror, for the pupillary field divides itself into two parts, one a central dim faint circular area having a diameter of 4 mm., and the other a clear annular portion surrounding it, in which the ordinary appearances of an eye affected with moderately high myopia are presented. The two areas are sharply divided from one another. Inside the central area the retinal vessels are seen to pursue pretty much their usual course, though in a rather erratic fashion, but on the slightest movement of the eye they twist and twirl about in a most bewildering manner; the part of a vessel seen within the central area pursuing the same apparent (myopic) course as the part in the surrounding ring, but in a much more rapid and erratic way, so that occasionally a vessel looks as if it were looped or knotted on itself.

When the cornea is directed straight forwards, the corneal reflex appears to overlies the exact centre of the central area; on looking up, the reflex lies on its lower edge; on looking down, it lies on the upper edge. On looking either up or down the dull ring separating the central from the peripheral area becomes slightly flattened, and its edges more decided, especially that nearer to the margin of the pupil.

The use of a plane mirror makes these conditions more evident, viz., the clear peripheral zone, then the dull ring and the enclosed bright circular area. When the observer is very careful to hold the mirror exactly facing the eye ("square" to it), nothing further is to be seen, except that the peripheral zone appears, when compared

with the central bright area, to be faintly dim or dull, and to be equally so all round. But on the slightest movement of the mirror, so that it presents the least obliquity towards the eye under examination, an immediate change occurs; the dimness in the outer zone "runs together," concentrates itself into two patches, of which one—which is much the darker—occupies the whole breadth of that portion of the zone distant from the mirror, while the other, fainter patch, in the form of a truncated cone, is situated in the "near" portion; the central area remains unchanged.

When the obliquity of the mirror is at all considerable, however, the aspect becomes further altered. The pupillary field is now crossed by a bent band of light, perhaps 1·5 mm. in width, which passes through the centre of the pupil and separates a smaller area of medium darkness in the concavity of the bend, from a larger area of complete darkness beyond the convexity of the bend; the horns of the somewhat crescentic or bent band of light, which stretches right across the pupil from side to side, being towards the face of the mirror. Slight movements of the mirror, as in performing retinoscopy, caused these three portions of the pupil—the light, the dull, and the dark—to whirl round in a wheel fashion with the greatest rapidity.

Examination of the image of the flame of a candle reflected from the posterior surface of the lens gave most interesting results which also tended to confirm the diagnosis. Compared with the corresponding reflex in the other eye, the image was exceedingly small (on account of the shortness of the radius of curvature); it was indeed so minute that it was difficult to see, and its excursion when the candle was moved was very slight. For purposes of comparison I placed a candle at such a distance from the right eye, and moved it up and down along a path of such a length, that the posterior image executed an excursion of 4 mm.; the minute

image in the left eye when the experiment was conducted with it, the conditions remaining the same, scarcely travelled 1 mm.

The refraction of the eye, even at the peripheral parts of the pupil, was myopic, though much more so at the centre than through the outer ring; there was a somewhat large staphyloma posticum, which showed evidence of former alternate advance and arrest; there were also pigment alterations in the choroid close to the macula, and one or two floating opacities in the vitreous humour, which on account of the condition of the lens it was impossible exactly to localise; but there was no trace of a persistence of the hyaloid artery, as I thought I should not improbably have found, and no further congenital abnormality.

Seeing that an elaborate article by Müller (Vienna) has been published so recently on this subject (*Klin. Monatsbl. für Augenheilk.*, June, 1894) and reviewed in this journal (1894, p. 273), in which paper all the points are amply discussed and the previous cases compared, it does not seem necessary to enlarge upon these matters at present, but simply to refer to the above-mentioned writings. I would merely say in reference to the classification of such cases drawn up by Müller, that in Mrs. B. the condition was unilateral, was *probably* present early in life; that there were no opacities of the lens, no traces of a hyaloid artery, and that the size and behaviour of the posterior lens reflex convince me that the anatomical condition is that of a localised increase of convexity of the posterior portion of the lens, though why so sharply localised unless an "accident" of congenital nutrition, I cannot say.

DAMAGE TO VISION CAUSED BY WATCHING AN ECLIPSE OF THE SUN.

BY JAMES W. BARRETT.

SURGEON TO THE VICTORIAN EYE AND EAR HOSPITAL.

ON September 29 last, an eclipse of the sun was visible in Melbourne at six minutes past four in the afternoon, and M. S., a girl of 17, watched it with several other people for a quarter of an hour or thereabouts. She used for protecting her eyes four pieces of coloured window glass, two being dark blue, and the others red and yellow respectively. These she placed one over the other before her eyes, and with both eyes watched the eclipse. She is certain that she did not look at the sun except through the pieces of glass. For an hour subsequently she was unaware that there was anything the matter with her sight, and then by accident discovered that there was a mist before the left eye. She ascertained that there was no disturbance of the right. She did not notice anything in the way of an after-image, nor feel any pain or discomfort. A fortnight later she came to the hospital complaining that there was a haze before the left eye, and that when she looked at a word some of the centre letters seemed to be missing.

The right eye and its vision and field were normal; with the left eye V. = $\frac{5}{5}$ partly, and spells out Cowell, l., the centre letters of the line being left out and represented by a dark space.

The field, as tested by the perimeter, was normal except for the presence of a very small central scotoma, which measured at 50 cm. vertically 4 mm., and horizontally 3 mm., and at 5 metres 6 cm. by 5 cm., and had the shape of a nearly circular oval. At 50 cm. for a distance of 2 mm. around the scotoma, macropsia was noticeable.

The pupils acted normally, and the media were clear. The fundi were healthy. The yellow spot in the left eye was a little larger than in the right and a little darker in colour, but hardly of a pathological appearance.

Three months afterwards there was no change. The defect of vision, the size and shape of the scotoma and the macropsia had not altered. With both eyes open, patient experienced no discomfort from the condition, as she was able entirely to ignore the scotoma.

Cases like this are not common, although after every eclipse a few come under treatment, the occurrence of the eclipse inducing a number of people to gaze at the sun. It is to be noted that the coloured glass used was apparently not sufficient protection.

W. DE W. ABNEY (London). *Colour Vision.*
London : Sampson Low, Marston & Co., 1895.

This is a volume of more than two hundred pages, with a coloured plate of the spectra of normal and abnormal colour vision, and numerous diagrams. It is a somewhat enlarged version of the Tyndall Lectures delivered at the Royal Institution in 1894. Chapter I. presents the structure and physiology of the eye in so far as is needful for the purpose in hand. Subsequent chapters deal with the phenomena of colour perception from the scientific side, and with the practical question of the detection of colour blindness.

The instrument with which the major part of the author's investigations was carried out is an arrangement

of prisms, lenses and reflectors, by means of which coloured light from any part of the spectrum, or from several parts simultaneously, can be thrown upon a screen, and, in juxtaposition with this colour patch, a patch of white light emanating from the same source can be placed for comparison. The luminosity, both of the coloured and of the white patch, can be varied at pleasure by the interposition of a rapidly revolving sector in the path of the beam of light; the relative luminosities of the several spectrum colours of which the colour patch may be compounded can also be varied at pleasure by altering the width of the slits placed in the spectrum.

Experiments with this instrument demonstrate the fact that the eye is unable to distinguish between the sensations produced by a single spectrum colour, and by certain mixtures of spectrum colours; in other words, that its power of analysing colour sensations is very limited, the perceiving apparatus not having the complexity which would be necessary to enable it to differentiate between simple and complex colours. From this and other facts concerning colour mixtures comes the inference that vision is really trichromatic, that sensations of three colours suffice, in various combinations, to produce the sensation of any of the others. The reaction on each other of two connected pendulums which have different periods of oscillation is used to illustrate the hypothesis that the perceiving apparatus in the eye may be set in motion by other light waves than those whose vibrations are identical in rapidity with its own. It appears that certain light waves may set each of the three kinds of perceiving apparatus in motion, and the impression given by the sum of the three, for a wave which is out of tune with all of them, may be even greater than that produced by a wave which corresponds with one of them.

Experiments with very low degrees of luminosity show that the basis of every colour perception is a simple light perception without colour, that is to say, that every colour, when sufficiently reduced in luminosity, is seen as simple light without colour before it disappears altogether. The

relative luminosity of the different spectrum colours, and the sequence in which, under lowered illumination, each is reduced to the fundamental achromatic light sensation, is demonstrated by further experiment, and is illustrated by familiar phenomena, *e.g.*, the curious colour of a moonlit landscape, and the unequal disappearance of the colours of flowers at night fall, orange flowers remaining plainly visible when a red geranium appears already as black as night, the green of the grass being transformed to grey, while the yellow of the flowers upon it is still discernible. In this connection the author demonstrates that a person with normal vision, viewing a spectrum, the luminosity of which is continuously lowered, passes through a state of red blindness, and then through one of monochromatic vision, before the spectrum becomes invisible, and that his visual sensations under such circumstances closely resemble those of the partially and totally colour-blind under ordinary circumstances.

With regard to the rival, Young-Helmholtz and Hering, theories, the author does not commit himself. He points out difficulties in the acceptance of either, and suggests a modification of the older theory which would account for certain phenomena not yet accounted for. He supposes that each of the three primary colour sensations (Young-Helmholtz) may be compounded of fundamental light and of colour in definite and fixed proportions, the proportion being different in each, and further, that the perceiving apparatus for each of the three primary sensations has two functions, one to respond to the fundamental light, the other to the colour. This hypothesis, unlike that of Hering, makes the response to white light a definite part of a colour sensation. He urges that any satisfactory theory must explain the fact that with lowered illumination the sensation of colour is lost before that of light. The "light colour" theory commends itself as probable when colour vision is regarded from the evolutionary point of view. There are many reasons for thinking that the visual sensation first evolved was that of light, and that colour sensations, blue first, red last, followed later.

"Whatever theory of colour sensations may prove to be the right one," says the author, "I lean strongly to the idea that the cause of vision will be found in chemical action induced by the impact of the different wave lengths of light falling on sensitive matter. A white substance may absorb all the wave lengths found in the spectrum, and if it have three sets of molecules, one of which has an atom or atoms vibrating with the same period as the waves of light which show a maximum for one sensation, and another for another, and so on, the requirements for the colour sensations are met." In support of the theory of chemical action, he gives some remarkable analogies between the reactions of the retina and those of the sensitive salts used in photography.

In describing various methods of experimenting, the author emphasises more than once the errors which arise through absorption of colour by the brown pigment of the retina in the region of the macula. In accurately matching patches of colour of small dimensions the result necessarily varies with the distance of the observer, according to whether the retinal image of the patch is confined to the macula lutea, or extends beyond it. In cases of central scotoma, for example, in tobacco amblyopia, the same caution is necessary in higher degree, for while a man thus affected is totally unable to discern the colour of a distant light, or of a small coloured object close at hand, he may succeed perfectly in matching the test skeins of coloured wool, the retinal pictures of which extend beyond the limits of the scotoma. For the examination of such cases Captain Abney recommends the use of small coloured pellets of clay.

Captain Abney's conclusions concerning the practical testing of the eyesight of candidates for the public services need not be repeated here. They have been made known through the report of the Colour Vision Committee of the Royal Society (see *OPHTHALMIC REVIEW*, 1892, p. 157). To that report it is largely due that the Board of Trade has, at last, and after much importunity, introduced a satisfactory test of colour vision. He points out, however,

that even the present regulation falls short of what is required. A candidate failing in the colour test has his certificate endorsed, but is still at liberty to seek and obtain employment at sea. Why is the certificate not withheld entirely, as it is from a candidate who fails in theoretical navigation? "Surely," says Captain Abney, "it is as dangerous that a signal should be misread as it is that the logarithm of the sine of an angle should be misunderstood." For those candidates who, being rejected on examination by the wool test, may desire to appeal to a higher court, the author recommends the spectrum test as described in this volume. For malingerers who, desiring to escape from their contracts, might succeed after some coaching in persuading the examiner that they were partially colour-blind, the spectrum provides an infallible ordeal. "A malingerer has no chance of escaping detection with the spectrum tests."

P. S.

H. E. SWANZY (Dublin). *Handbook of Diseases of the Eye. 5th Edition. H. K. Lewis, London, 1895.*

The fifth edition of this well-known text book, in the preparation of which the author has been assisted by Dr. L. Werner, will, we think, fully maintain the reputation established by the previous editions.

The book is larger than its immediate predecessor by 44 pages, and has been enriched by five new illustrations.

The more noteworthy additions are, as mentioned in the preface, "descriptions of the astigmometer and its use, of the effect of electric light on the eyes, of scintillating

scotoma, of ophthalmia nodosa, and of enophthalmos." The articles on tubercle of the iris and on tumours of the optic nerve have been re-written. The chief changes are in chapter xv., on "Diseases of the Retina," which has been rearranged as well as enlarged, and in chapter xvii., on "Amblyopia and Amaurosis due to Central and other Causes." This latter chapter contains one of the best, if not the best, short account of these symptoms and their causation, and their diagnostic value in cases of intracranial disease, with which we are familiar.

In notices of the first and second editions (see OPHTHALMIC REVIEW, vols. iii. and vii.), we have expressed a high opinion of the merits of this handbook, and we have every confidence in reiterating these opinions. Although we do not wholly concur in all the author's views and statements, and think that he is, not infrequently, too dogmatic, we fully recognise and appreciate the many excellent features of his work, not the least of which is the lucidity of expression noticeable almost throughout the book.

A. ELSCHNIG (Graz). On So-called "Choked Disc." *Wiener Klinische Wochenschrift*, December 20, 1894.

In a paper read before the Ophthalmological Section of the Congress of Naturalists and Physicians in Vienna in September, 1894, Elschnig gives the results of his investigations concerning the pathological anatomy of "choked disc," and his views as to various theories relative to its pathogenesis, with special reference to the pressure theories. His results are based upon the examination

(*post-mortem*) of fifty-five cases of intracranial disease; of these there were twenty-one cerebral tumours, twenty-eight cases of inflammatory intracranial affections, exclusive of syphilitic lesions, and six cases of increased intracranial pressure without inflammatory appearances (hydrocephalus).

These researches, the author states, show most decisively that the ophthalmoscopic picture to which the term "choked disc" is applicable is indicative of an inflammation of the optic papilla characterised by a high degree of inflammatory swelling of all the tissues of the papilla, so that it protrudes from the scleral and choroidal aperture, and consequently separates the retina from the margins of the choroidal opening. In no case in which the swelling of the papilla was well marked were evidences of inflammation wanting. The name "choked disc" Elschnig thinks may be retained, but its meaning must be altered; it only indicates a variety of papillitis in which there is a high degree of swelling. The venous engorgement noticeable in these cases is not an important sign, and, far from being the cause, is the result of the papillitis. The swelling of the papilla is due to œdema and other products of inflammation.

In all the cases in which inflammation of the papilla was present there were microscopical evidences of similar changes in the trunk of the optic nerve. The arguments against the production of "choked disc" by pressure which the author mentions are sufficiently well known, and we need not now repeat them; suffice it to say that from his own investigations he concludes that in whatever way the "choked disc" is produced, it is not due to mechanical interference with the circulation.

According to the Leber-Deutschmann theory optic neuritis in intracranial tumours and other lesions may be caused by the presence of phlogogenic substances in the cerebro-spinal fluid, and consequently in the fluid traversing the intersheath spaces of the optic nerve. But can it be shown that such substances are present in the cerebro-spinal fluid in cases of cerebral tumour? In thirteen of

the writer's twenty-one cases of tumours of the brain more or less intense inflammation of the meninges was found; under such conditions inflammation of the optic nerve sheaths (peri-neuritis) would be a natural sequel, and the author thinks that this probably leads to an interstitial neuritis by simple extension of the morbid process.

J. B. L.

DIANOUX (Nantes). Tumours of the Lacrymal Gland. *Annales d'Oculistique*, August, 1894.

Professor Dianoux has recently had the opportunity of watching and operating on no less than three cases of this rare disease within the space of a few months.

The notes of his observations are shortly as follows :

CASE I.—Mrs. B., aged 36, consulted him first in December, 1891. The right eye was proptosed and pushed downwards and outwards; the movements were very limited, the sight intact, and there was nothing abnormal to be discovered by the ophthalmoscope.

The patient was unable to say exactly when the swelling was first noticed, but she was sure that it had been present for several years—seven at least. There had been little or no pain. She had had syphilis when 22, and there was also a history of a violent blow on the temple. The globe was dry, and she had observed that the tears from this eye were fewer than from the other.

The lacrymal gland, enormously enlarged, could be distinctly felt under the edge of the orbit. Energetic anti-syphilitic treatment was adopted but without any beneficial result; the swelling steadily increased.

On March 26, 1892, the writer dissected out the tumour from its attachments without any difficulty, except that at the bottom of the lacrymal fossa he found a perforation in the bony wall, and was obliged, at this point, to proceed with great care. The perforation measured 1 cm. transversely and 6 mm. from behind forwards. Healing occurred quickly and without complication, save complete anæsthesia of the right side of the forehead and head, which persisted for some months.

By the middle of July this anæsthesia had nearly passed off, leaving only a tingling sensation. The globe had resumed its proper place and there was binocular fixation.

Some months afterwards Dianoux detected a recurrence of the growth about the outer angle of the orbit, the eye being again pushed downwards and outwards. The fresh growth was removed without difficulty. The loss of substance from the previous operation had been made good by firm fibrous tissue. Recovery rapid and without incident.

At the end of November, 1893, the patient once more returned. By this time the whole orbit was invaded by the new growth, vision was abolished, and there was considerable semi-transparent œdema of the papilla, but no evidence of hæmorrhage. No cerebral trouble, no cephalalgia, and the right nostril seemed to be free.

The whole orbit was cleared out, this being the only procedure that could meet the requirements of the case. No less than three perforations of bone were discovered. The largest of these was up and in, and the pulsations of the brain could be felt through it. Outwards there was another, and a third was found on the internal wall. The perforation discovered at the first operation had become closed.

The patient was last seen at the end of March, 1894. The note of that date is: "The orbit remains hollow; the tissue which has partially refilled it is fibrous and rather resistant; the right side of the nose is clear; there is no pain and the health is excellent." The eye and optic nerve although surrounded by the tumour were not invaded by it. The histological structure is briefly described below.

CASE II.—Marie B., aged 20, laundress, of good constitution. No specific history, either hereditary or acquired. No traumatism nor conjunctival affection. Since June, 1880, she has suffered from sharp pains in the head, apparently neuralgic in character, and chiefly temporal. They are accompanied by a certain amount of giddiness. These attacks, which occur generally at intervals of about a fortnight, do not, the author thinks, bear any necessary relation to the lesion of the lacrymal gland; this is painless even to pressure. The patient states that the swelling has been present for eighteen months. The eye is pushed downwards and outwards as in the preceding case, and the general characters of the growth also correspond. No affection of sight; no diplopia. Operation in November, 1892: the incision was made parallel to the eyebrow, but rather below the orbital edge, so as to avoid as much as possible the branches of the ophthalmic division of the fifth. The tumour, which was closely surrounded by a fibrous capsule, was easily shelled out. The lacrymal gland alone was affected; it was enormously hypertrophied, and on section looked homogeneous in character, the tissue being soft, friable, greyish and semi-transparent. Healing occurred without a hitch. No ptosis.

In September, 1893, everything still looked well, but the patient complained of some pain in the cicatrix.

In February, 1894, she came again, this time with a pronounced recurrence. The orbit was invaded by a firm, hard tissue, adherent to the bone and pushing the eye downwards and inwards.

Interference was considered dangerous, and so nothing was done at the time; but subsequently, at the patient's urgent request, the tumour was once more removed. It was found to be adherent to the bone in the greater part of its extent. Down and in, in the position of displacement of the eye, the orbit was free. Neither perforation nor osseous ulceration was detected. The eye and its appendages, except the external rectus, which it was necessary to divide, were left untouched in the course of the operation. The patient left the hospital early in May; there is no subsequent note of her condition.

CASE III.—P. G., a woman aged 50, of weak intellect, and with left-sided facial paralysis, came to the Hôtel-Dieu in March, 1893. The left upper lid was swollen and heavy, but painless. The eye was turned down but not pushed outwards. Ocular movements good; no diplopia. Nothing abnormal discovered in the fundus. There was anæsthesia over the area supplied by the first division of the fifth nerve. No satisfactory history of the onset of the growth could be obtained owing to the patient's deficient mental capacity.

Underlying the roof of the orbit and most prominent at a point midway between the inner and outer angles there was a hard mass, everywhere sensitive to pressure. It was impossible to define the limits of the growth by palpation. Operation by the same method as in the two previous cases. The tumour was found in the form of a tough yellowish cake about 3 mm. in thickness, moulded under the arch of the orbital roof. It was easily separated from the bone with a blunt instrument. The lacrymal gland was intimately involved in the new growth, which on farther examination turned out to be tubercular. Recovery took place, but there is no note made in the present paper of the later history.

In his remarks on the lessons to be drawn from the study of these cases, the author emphasises that of early operative interference. To waste time in attempting to combat by anti-syphilitic drugs a malady which is very doubtfully syphilitic, is, he considers, a serious error. It is of the utmost importance to remove the growth before it has spread beyond the limits of the gland itself. Unfortunately, cases of this kind are not generally seen in their early stages. The very slow growth which is characteristic of them is apt to engender a false security and to encourage delay in seeking advice.

Amongst the minor advantages of early operation is the possibility of removing the gland by way of the conjunctiva, rather than by an incision through the skin below the upper edge of the orbit—a method which is in all respects inferior to the first.

We add a very short note of the histological structure of these growths, as described by Professor Malherbe, of Nantes. Four specimens were submitted to him for examination. Of these, one—from the third patient—was tubercular, and may be omitted from farther consideration. Of the three others, two are from the first patient—the growth originally removed and the recurrence—and the other is that taken from patient No. 2. All three are of identical structure.

The tissue is composed of a stroma, and of a mass of cells enclosed in it. The stroma consists of fibrous tissue, sometimes formed of fibrils, sometimes of thickish bundles closely ranged together in a firm texture. Here and there also they are swelled, and are more like mucous tissue, while in other places they are almost elastic in character. As well as the thick partitions which enclose the epithelial structure, there are numbers of connective tissue processes which penetrate into the midst of the epithelial masses. These very often assume a mucous appearance. Traces of obliterated capillaries are here and there observable. Numerous clear spaces, which look as if they were filled with mucous tissue, are seen in the midst of the epithelial structure, separating it, one part from another. The growths, says Malherbe, are of the type to which Billroth gave the name of cylindroma, but which is better described as polymorphous epithelioma. Similar growths in the salivary glands are not infrequently met with.

N. M. ML.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

THURSDAY, MARCH 14, 1895.

D. ARGYLL ROBERTSON, M.D., F.R.S.E., President, in
the Chair.

Case of Double Optic Atrophy, with Peculiar Visual Fields.—Dr. George Ogilvie read notes of this case. The patient was a man, aged 57, who was a sorter of cigars, and a moderate smoker. His vision failed in December, 1893. He had previously had epileptic fits, and came of a family with a very neurotic history. The movements of the eyes were normal, the pupils acted sluggishly to light. In October, 1894: V.R. $\frac{6}{18}$; L. fingers at 10 feet, with eccentric fixation. Mixed astigmatism in both eyes. He had floating opacities in the vitreous. Both optic discs were pale, the retinal veins were tortuous; there was a congenital crescent in both eyes. R. visual field was contracted for white and colours; a sector down and in was absent. L. visual field: contraction of the field, and complete inferior hemianopia. There was neither sugar nor albumin in the urine; no history of syphilis or alcohol. The knee-jerks were exaggerated, and a moderate degree of ankle clonus was present. The character of the visual fields pointed to change in the optic nerve itself; it was doubtful if it were a primary atrophy or the result of a neuritis. From an old Moorfields letter in his possession, it was found that he had attended there while suffering from optic neuritis. In February, 1895, the upper and inner quadrant of his R. visual field was missing, giving an appearance of R. lateral hemianopia.

Dr. James Taylor thought it was not necessary to go further than the nerve to explain the ocular symptoms in this case. It was not a case of destructive lesion in the occipital lobe; there was a history of past optic neuritis, and this was the explanation of the changes.

A Case of Filaria Loa.—Further notes of this case, which he had brought before the Society in October last, were

read by the President. After removal of the parasite the patient was not troubled further for six weeks; on February 6 a worm was felt again, but was sought for in vain. Two days later a swelling appeared in the right temporal region. On February 13 the worm was felt beneath the right upper eyelid; it wriggled across and then remained coiled up there. An incision was made, and, after some dissection, a fine filamentous body, smaller than the ordinary filaria, was found; this was identified later as part of the expressed oviduct; a well-formed filaria was found deeper in the tissues, with its oviduct protruding. The blood had been examined many times in the last six months, but no traces of the filaria or its embryos could be found. The patient had occasional swellings of the skin of the arm, such as occur often among residents in Old Calabar. As to the origin of the worms in this case, although the patient had been careful about her drinking water, she had, for ten days before leaving Old Calabar, been too ill to purify the water, and may have become infected by impure water during this time.

Case of Traumatic Cataract with a Foreign Body embedded in the Lens.—Mr. W. Spencer Watson read this paper. A plumber, aged 29, had injured his right eye several times, but was not aware that a foreign body had entered his eye. The foreign body was seen, however, in the cataractous lens, which was dealt with first by discission, and subsequently by linear extraction, the foreign body being removed at the second of these operations. Everything went smoothly, and when the patient was seen a year afterwards there was a normal-looking pupil, and vision remained good. Mr. Watson pointed out that the time for extraction when a foreign body was present required very careful regulation, the gradual softening of the lens being watched until it became of a semi-solid consistence, and the operation performed before it had become fluid.

A Form of Iritis not usually recognised.—Dr. Brailey read this paper. After a summary of several cases, he arrived at the following conclusions: That a late iritis sometimes

follows an acquired syphilis, and that the average time of its attack is about thirteen years from the primary sore. That such iritis is generally double-sided, and its usual form an iritis serosa, that is to say, an iritis or rather an irido-cyclitis with comparatively little tendency to the formation of posterior synechiæ, and accompanied by dots on the posterior corneal surfaces and also by a tendency to secondary glaucoma. That the patient may show other late manifestations of syphilis, as in the cases shown, of which one has ozæna and the other choroiditis disseminata. That a similar late iritis may follow an inherited syphilis, and that the average age of the subject of it, though varying within wide limits, approximates to twenty-one. That in inherited, as in acquired syphilis, the usual form is a double serous iritis. The iritis may, however, be of a much severer type, with varying tension and with the occlusion of the pupillary area with a layer of lymph, such lymph being generally comparatively free from the iris at the pupillary edge. That such an iritis may also be accompanied by larger and more cloudy dots on the posterior surface of or perhaps deep in the cornea, such deposits with the others resulting in the formation of a dense non-vascularising triangular plaque deep in or behind the cornea, and usually at its lower part. That the iritis may more rarely be of a different type, either the gummatous with occasionally peripheral anterior synechiæ, or the adhesive leading even to occlusion of the pupil and consequent secondary glaucoma. That apart from the iritis, which simply attends and is quite secondary in degree to severe interstitial keratitis, the late serous iritis of inherited syphilis may show a close relation to interstitial keratitis. Thus a slight interstitial keratitis may be followed after a distinct interval by a gummatous iritis, while the iritis with blocked pupil, deep triangular corneal plaque, and varying tension may be accompanied by fine filmy or denser and wider-spread opacities in other parts of the cornea. Notched teeth are rare or perhaps even uniformly wanting in the pure iritis serosa of late inherited syphilis, while they are present in increasing frequency

as the disease approximates in its associated characters to interstitial keratitis. It is very noticeable that the subjects of the late serous iritis of inherited syphilis are often of extremely good physical development.

Mr. Higgins thought that one of Dr. Brailey's cases looked like an old case of interstitial keratitis, and he asked if such an intercurrent attack could have occurred.

Mr. Spencer Watson said he would be glad if Dr. Brailey would emphasise the points of novelty in these cases; he had been familiar with them for some time, and thought they were generally recognised.

Mr. Jessop said that one of the cases showed punctate dots on the front of the iris, similar to those he had shown recently at the Society.

Mr. Lang said there were ring synechiæ between the periphery of the iris and the cornea, or sometimes isolated peripheral anterior synechiæ in these cases.

Dr. Hern asked if the iritis was primary, or an extension from keratitis.

Dr. Brailey said in these cases the iritis was independent of keratitis. As to the case of which Mr. Higgins spoke, the boy had been continuously under observation, and the white plaque had developed from a keratitis punctata, and not from an interstitial keratitis.

Card Specimens.—Dr. Sydney Stephenson: An Improved Test Type.—Dr. A. Bronner: Wire Eye Shields, for use after Cataract Operations.—Messrs. Hartridge and Griffith: Cholesterine in Sub-retinal Fluid of a Detached Retina, in the Eye of a Child removed for Buphthalmos.—Mr. Hartridge: Cholesterine in the Anterior Chamber.—Mr. C. Devereux Marshall: Microscopical Sections of (1) An unusual Syphilitic Growth, and (2) Tuberculous Growth.—Mr. Jessop: Primary Sore on Upper and Lower Lid.—Mr. Vernon: Case of Pulsating Tumour of Orbit.

CASES OF AMAUROSIS AFTER INJURY TO THE HEAD. ? HÆMORRHAGE INTO THE OPTIC NERVE SHEATH.

BY EDWARD NETTLESHIP, F.R.C.S.

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BLINDNESS of one eye following immediately after injury to the front of the corresponding side of the head is common enough to pass without special comment. The blindness is almost always permanent, and when the cases are seen some little time afterwards, the disc always shows well-marked atrophic change. It is assumed that the nerve in these is ruptured just behind the foramen or practically destroyed by compression from fracture running across the optic canal. The blindness is not always total, but the state of the sight very seldom alters either for better or worse after the first few days. In the rare cases where recovery of sight takes place, it seems most probable that the damage has been due to effusion of blood into the sheath space of the optic nerve rather than to injury of the nerve itself. That distension of the inter-sheath space by blood may occur is well shown by a case recorded by Priestley Smith in the *Transactions of the Ophthalmological Society* (vol. iv., p. 271), of which an excellent plate is given. The case was complicated, and whether the hæmorrhage compressed the nerves enough to affect the sight could not be determined.

In the first of the following cases the sight of both eyes was entirely lost within two hours of the injury to the head, and without other severe head symptoms. After a fortnight recovery began, and in about a month vision had attained the condition in which it has since remained (see below).

In the second case, in which only one eye was affected, the notes, although less complete, are sufficiently full to warrant record.

A short note of a third case is given in which changes like those seen in retinal embolism came on about two weeks after a fall on the front of the head, the eye having probably been blind from the time of the accident. This case might, perhaps, be explained by persistent compression of the nerve and the central vessels by a large clot in the sheath.

Case 1 (Notes by Mr. MacLehose).—Fracture of base in early childhood, followed by total loss of sight in both eyes. Recovery—nearly complete.

January 16, 1895.—A. W. H., aged 30. When 7 years old fell from a height of three feet on to the road, striking his head against the edge of a stone gutter. Cicatrix of scalp wound is still well marked. It begins at a point one inch behind the right frontal eminence, and runs backwards and slightly inwards for two and a quarter inches. There was considerable hæmorrhage at the time of accident, but the wound was strapped up by a chemist, and the child was able to walk home without difficulty. No hæmorrhage from nose or ears, and no subconjunctival bleeding. Patient does not think there was any vomiting, but is not sure. *Two* hours after accident, while he was playing with other children, he suddenly became giddy, and then completely blind. No P.I. Remembers that he was tested with a lamp, and that he could not distinguish light from darkness. For about a fortnight after injury the blindness remained complete, and then sight gradually began to return, and, according to parents' account, was

all right again four weeks later, *i.e.*, in six weeks from the accident.

Treatment nothing special. Quinine and iron. Rest not advised.

Condition of pupils and ocular muscles at time not known, but never heard that there was anything abnormal.

$$V. \left\{ \begin{array}{l} R. \frac{6}{60} \frac{- .75^D \text{ sph.}}{- 1^D \text{ cyl. ax. } -} = \frac{6}{24} \text{ and } \frac{6}{18} \text{ 1 letter.} \\ J. 6 \text{ fairly; } J. 4 \text{ slowly. With correction gets} \\ J.j. \text{ at 6 in.; better when looks rather in-} \\ \text{wards.} \\ L. \frac{3}{60} \frac{- 4.5 \text{ sph.}}{- 1 \text{ cyl. ax. } \searrow 30^\circ} = \frac{6}{6} \text{ 5 letters.} \end{array} \right.$$

J.j. at 8 in. With correction = J.j. from 10 in.

Pupils active. R. pupil 4 mm.; L. pupil $4\frac{1}{2}$ mm.

T.n. Convergence and ocular movements good.

Tested with Bjerrum's types;

With correction $\left. \begin{array}{l} R. \frac{6}{60} \\ L. \frac{6}{12} \end{array} \right\} \begin{array}{l} \text{3 letters} \\ \text{3 letters} \end{array} \text{ to my } \frac{6}{6} \text{ 3 letters. (N. M. ML.)}$

Tested with Holmgren's wools; confuses No. 1 (pale green) with pale buff when left eye is closed, and even with both open is not always quite sure.

Fields.—R. slightly contracted; L. almost full.

(Note by Mr. Nettleship.) R. disc greyish pale all over; fairly defined edges; area of disc quite clear; large vessels abundant and of good size; small vessels fairly abundant. L. disc grey all over, but not so pale as R.; otherwise the same.

Case 2 (Notes by Mr. F. W. Marlow).—Amaurosis after injury to head. Vision failing two days after the injury. Hæmorrhage from nose six days after injury.

November 12, 1881.—Eliza B., aged 50, fell on the kerbstone and cut her right temple; she was unconscious for four hours. Found vision of R. defective on the 14th, after closing her eyes for a moment because they ached. She believes she could see well with it before. Pupils said to be equal on 14th. On 15th, R. cannot count fingers.

18th.—Some epistaxis chiefly from L. nostril. On the 19th there was pain across the forehead and in the eyes. Clots of blood from mouth when she blows her nose.

24th. — Atropine several days ago. Ophthalmoscope normal. Bare p.l. concentrated by lens.

December 10, 1881.—The vision of the R. rapidly improved and had become very good when she left the hospital on the 7th.

Case 3 (Notes by Mr. F. W. Marlow).—Amaurosis following injury to the head. (?) Hæmorrhage into sheath of the optic nerve.

March 27, 1884.—Robert H., aged 30, coal porter. Half an hour before admission he fell a height of twenty feet into a coal bin upon his face; he was unconscious for a short time before admission. On admission he was found to have double Colles' fracture, lower jaw fractured in two places, fracture of upper jaw, hæmorrhage from nose and mouth and cut through upper lip. There was a wound going down to the bone at the root of the nose. Ecchymosis of eyelids, some ecchymosis of ocular conjunctiva; slight bleeding from left ear.

Four or five days after accident, blindness (absolute) of L. eye noticed.

April 14.—Nearly complete paralysis of right external rectus; other movements normal. Secondary squint very marked. L. eye movements normal. L. pupil has no direct action to light; indirect action good. No perception of light.

Ophthalmoscope. — Left optic disc rather pale, veins normal; arteries somewhat diminished in size. There is slight haze of the optic disc and central region of retina, the fovea centralis showing as a cherry red spot. R. fundus probably normal; some doubtful haze of margins of optic disc. (F. W. M.)

April 16 (Note by Mr. Nettleship).—Arteries decidedly diminished and there is a good deal of haze. The appearances are like those of embolism.

ON THE USE OF LARGE PROBES IN THE TREATMENT OF LACRYMAL OBSTRUCTION.

BY SIMEON SNELL, F.R.C.S.ED.

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THIS subject was introduced at the late Ophthalmological Congress at Edinburgh by Dr. Theobald of Baltimore,¹ and I desire now to say a few words in support of the treatment advocated by him.


My attention was attracted to the subject by reading Dr. Theobald's article in the *Archives of Ophthalmology* for 1878,² and immediately afterwards I had a series of probes made, and began to use them. My experience therefore extends over many years, during which period several hundred cases have been treated in the manner to be indicated. In the *Lancet*, 1880,³ a short article of mine was published, in which the advantages of large over small probes in the treatment of stricture of the lacrymal duct were set forth. A very much wider experience allows me to confirm what I then wrote, and in my own practice lacrymal cases have always appeared to me to be more satisfactory than, as far as I could gather from conversation, or from what has been written, has been the case with other surgeons. The statement that Dr. Theobald originally made as to the nasal duct in the dry skull allowing the passage of a 4 mm. probe is perfectly correct. In my article in the *Lancet*, above referred to, it was stated that I had ascertained for myself that in several skulls such a probe passed readily.

¹ *Transactions of Eighth International Ophthalmological Congress*, p. 207.

² Vol. vi., page 477.

³ Vol. ii., page 170.

At the Ophthalmological Congress, Dr. Theobald made the following interesting statement on this point.



"Among the seventy ducts belonging to the adult skulls, none was found so small as not to admit the passage of a probe of 3 mm. diameter, and there were only six through which a larger probe than this could not be passed. Thirty-five, or fifty per cent. of the whole number, permitted the passage of probes varying in diameter from 4.25 to 7 mm. Seventeen of these admitted a probe of 4.75 mm. diameter, four one of 5.25 mm., one one of 5.75, and one, the fellow to this, one of 7 mm. Between the canals of the same skull an appreciable difference in size was discovered in eighteen instances, in four the difference was only .25 mm., in ten it was .50 mm., in one it was .75 mm., in two 1 mm., and in one it amounted to 1.25 mm."

These facts afford distinct evidence of the impossibility of the smaller probes varying from 1.5 mm. to 2 mm. as the largest, being able to restore the normal calibre of the duct which is so much larger. My experience also is not in accord with those who are afraid that the employment of these larger probes will diminish or destroy the suction power of the lacrymal apparatus. I recollect no instances that would lead me to suppose that such a condition was brought about.

In 1879 I had lacrymal probes constructed by Messrs. Weiss, and subsequently by Messrs. Down Bros. and other instrument makers, which, while agreeing as to size, differed in the bend which was adopted in those advocated by Dr. Theobald.

The case contains six silver probes, each of which is able to be used at either end, the one being larger

than the other. I gave up calling the probes by numbers and had the size in millimetres stamped on each end of the probe, so that the exact size used was readily ascertained. The smallest of these probes is 1·25 millimetres one end, and 1·5 the other. The other sizes are 1·75 and 2, 2·25 and 2·5, 2·75 and 3, 3·25 and 3·5, and 3·75 and 4. Besides this there are two smaller straight probes which can be bent and used for the nasal duct or for only probing the canaliculus as may be required. The bend is illustrated in the wood-cut supplied by Down Bros. and allows for the projection of the eyebrow; moreover, in withdrawing the probe it is often convenient by turning it round to use the back curve.

I showed these probes at the Cambridge meeting (1880) of the British Medical Association in a discussion which followed the reading of a paper by Mr. J. Couper, also on the use of larger probes in lacrymal cases, and mentioned Dr. Theobald's work on this subject and also the previous publication of my paper already referred to.

The plan adopted by me in the use of these probes is the following. The canaliculus is slit up by Weber's or Liebreich's knife. The latter is used more frequently. I do not as a rule begin with the smallest probe. If the 1·5 mm. will pass it is succeeded by 2 mm. and 2·5 mm., or it may be 3. The next day the largest probe previously passed is again used, followed by the next size. The patient is not seen again for two days, then for three or four days, then for a week, until four or five weeks elapse. If the case is satisfactory, as it usually is, the attendance will then cease. It is rarely necessary, in my opinion, to use the 4 mm. probe, but the 3 is constantly required, and less frequently the 3·5.

In conclusion, I would add that my experience after sixteen years is most satisfactory. Formerly when using smaller probes I employed in many cases styles,

a particular favourite being that in which the upper part was bent, so that it lay hidden in the slit canaliculus. For a considerable time, however, I have rarely used these or other such means and have more and more depended on the treatment by the large probes alone. The bulk of the cases coming before me are cured or very much benefited. Those in which improvement does not take place are very few. In these respects my experience is better than it was when employing smaller probes.

THE REMOVAL OF POWDER GRAINS FROM THE CORNEA AND SKIN BY THE GALVANO-CAUTERY.

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PROFESSOR OF DISEASES OF THE EYE IN THE PHILADELPHIA
POLYCLINIC, SURGEON TO WILLS EYE HOSPITAL.

GUNPOWDER is an intimate mechanical mixture of charcoal, sulphur and saltpetre. The exact proportions of these ingredients vary in different makes of powder. The United States Army powder contains charcoal and sulphur each 12·5 per cent., and nitre 75 per cent. The British powder has sulphur 10 per cent., charcoal 15 per cent., and nitre 75 per cent. These different constituents are finely pulverised and so mixed as to be brought into the most intimate mechanical association. Each powder grain then is made up of a great number

of minute particles of charcoal and sulphur, embedded in a mass of potassium nitrate. When such a grain is driven into the skin or other part of the body, and subjected to the action of the tissue fluids, the potassium nitrate is promptly dissolved, the sulphur also disappears, and the small particles of carbon thus liberated become diffused throughout the neighbouring tissue, and cause the indelible stain characteristic of an injury by unburned powder. The combustion of gunpowder is not entirely instantaneous, the sulphur takes fire first, and in some cases the diffusion of the minute particles of charcoal may be accomplished partly by the incomplete explosion of the grain imbedded, the process of combustion being checked before these particles can be consumed.

It is probable that the failure to recognise the composite nature of the powder grain, and its prompt dissolution and diffusion in the body, is the cause of much disappointment as to the results of attempts at its removal. The degree of the staining is in some measure proportioned to the amount of charcoal remaining in the tissue. But even if the greater part of a grain of powder be removed, the retention of but a small proportion of the minute particles of which it was composed will cause a stain that is very noticeable. The very considerable literature of the subject testifies that the ingenuity of the surgeon with regard to this matter has been directed mainly toward the invention of knives, curettes, &c., and methods of using them, with the idea of extracting the grain as if it were a single coherent mass capable of complete separation from the adjacent tissues, which it probably is not in any case by the time it comes under the care of the surgeon.

The problem presented to the surgeon is not the removal of imbedded masses, but of microscopic particles diffused through limited portions of tissue. Some

realisation of this has led to the trial of blistering the part, or washing it with a powerful spray. These methods have given fairly satisfactory results in some parts of the body where the particles were all situated very close to the surface, but are quite inapplicable to the eye itself.

The impossibility of removing the diffused particles of charcoal without the destruction of the tissue through which they were diffused, led me three years ago to resort to the use of the galvano-cautery as the means by which such destruction could be effected with most accurate limitation to the tissue involved. The result was far more satisfactory than any attained by other methods; and I have repeatedly resorted to it since.

A small cautery tip, one of those for cauterising corneal ulcers, is employed. It is kept at a white heat, and the points involved touched in rapid succession, the contact being continued each time until it is thought that sufficient tissue has been destroyed. No especial after-treatment is required, and the sloughs come away in a few days with very little pain or irritation.

The resulting scars, even when thickly placed, cause a disfigurement quite insignificant in comparison with that left by the original injury, and one that becomes less and less noticeable with time, instead of increasing with the gradual wider diffusion of the particles of carbon.

It is important to apply the method as soon as practicable after the injury, that the diffusion, and therefore the amount of tissue to be destroyed, may be as slight as possible. For the same reason the first application should be thorough, although it can readily be repeated any number of times that may be necessary.

If more than a very few points are to be touched, a general anæsthetic should be employed. For this purpose ether is out of the question on account of its

inflammability. Ethyl bromide is not entirely satisfactory, because it does not readily sustain the profound anæsthesia necessary to prevent a slight twitching that proves very annoying, and greatly delays a somewhat tedious process. Chloroform is on all accounts to be preferred.

In this connection I wish also to call attention to the value of the galvano-cautery for the removal of certain foreign bodies other than powder grains, deeply imbedded in the cornea. Certain substances, especially particles of coal, in this situation are very liable to cause suppuration, hypopyon, involvement of deeper structures, and even loss of the eye. For these cases, or for less harmful foreign bodies, in the presence of acute or chronic conjunctival suppuration, the removal with the cautery point is safer than with any cutting or scraping instrument.

The cautery destroys the infection existing at the seat of injury, while other methods of extraction may tend to disseminate it, and lead to deep infection, and even to ultimate loss of the globe.

THIER (Aachen). Observations on the Operative Correction of Myopia. *Transactions of 8th International Ophthalmological Congress, Edinburgh*, p. 173.

FUKALA (Pilsen). Correction of High Myopia by Aphakia. Choice of Operation with regard to Morbid Changes in the Choroid. *The same*, p. 181.

PERGENS (Maeseyck). On the Correction of Short Sight by Aphakia. *Klin. Monatsbl. f. Augenheilk*, February, 1895, p. 42.

These three papers and the remarks which fell from several speakers in the discussion at the Edinburgh Congress, show that the operative treatment of high myopia has already given a large number of good results, and bids fair to become generally recognised as the right way of dealing with a certain class of cases.

The proposal to treat very high myopia by removal of the lens was put forward by Mooren so long ago as 1858, but obtained at that time no support. Von Graefe opposed it on the ground that the sclero-choroiditis, which he regarded as the essential cause of progressive myopia, could not be arrested by it, and that, therefore, no real relief would be obtained. Donders objected that the loss of accommodation involved in the removal of the lens would render the condition of the eye worse rather than better. Mooren himself had, later, to report the loss of an eye on which he had carried his idea into practice, and so, for the time being, the proposal fell into the shade.

In 1876, Mauthner, taking a different view of the matter, declared that if only the operation were safe he would advise all patients suffering from very high myopia to submit to removal of the lens. The credit of systematically and successfully introducing this line of treatment belongs to Fukala, whose first publication on the subject appeared in 1890.¹ Since that time, as the

¹ *Von Graefe's Archiv*, vol xxxiii., part 2, p. 230.

following list will show, his example has been followed by a considerable number of well-known operators, and the total number of cases, as deduced from the sources above given, is already sufficiently large to justify definite conclusions. Fukala, 42 cases; Thier, 38, Schweigger, 36; Pflüger, 40; Von Hippel, 6; Th. von Schroder, 10; Mooren, 15; Horstmann, 6; Topolanski, 4; Meighan, 3; Fergus, 9; Pergens, 11; total 220.

Two questions at once present themselves. Does the operation, when perfectly successful, materially benefit the patient? Does it involve any considerable risk? With regard to the first point the opinion of those who have the necessary experience appears to be unanimous. Benefit of two kinds is claimed: increase in the acuteness of vision, and increase in the distance at which the eyes can be used in near work; from these results come increased usefulness of the eyes and probably a lessened tendency to increase of the myopia.

Fukala, speaking of his own results and of those obtained by others, declares that there is, on the average, a two or threefold increase in the acuteness of vision. Thier says that the main object of the operation, namely, the improvement of distant vision, was brilliantly obtained in nearly all cases. In three of his cases the acuteness remained the same afterwards as before, but even this result is highly satisfactory, inasmuch as such patients can, after operation, enjoy good vision permanently with the aid of a glass of medium strength, whereas before the operation they can only obtain such vision by means of a very strong fully-correcting concave glass which they cannot tolerate for any length of time. The eleven cases recorded by Pergens are given with full details of the condition of vision with a correcting glass before and after operation. In no case was the improvement less than twofold; in three cases it was nearly fivefold, *e.g.*, from $\frac{5}{30}$ before operation, to $\frac{5}{6}$ after operation. This remarkable improvement in acuteness of vision as measured with types and correcting lenses is, of course, largely attributable to the very different size of the retinal pictures obtained respectively with a strong concave

glass before the removal of the lens, and the much weaker glass—in the service of Pergens a convex glass of $+1$ to $+7$ D.—after the removal.

The second benefit claimed is an increase of the distance at which reading and other near work is possible. The highly myopic reader is in this dilemma; if he use no glasses he must place the book very close to his eyes, and thus, even though he sacrifice binocular vision and allow one eye to diverge, incur the risk of further aggravating his myopia. On the other hand, if he attempt to increase his reading distance to a considerable extent by means of concave glasses he meets with a prohibitory reduction in the size of his retinal images. According to statistics given by Thier and by Pergens, the removal of the lens and the consequent substitution of a convex or weak concave glass for the strong concave glass previously required confers great benefit in this respect by reason of the enlargement of the retinal images. Patients previously obliged to abandon near work were able to resume it under the new conditions. Donders' objection to the operation—the loss of accommodation—proves, therefore, to be of no moment. The fact is that, whereas the highly myopic eye has a range of accommodation extending over only a few centimetres very near to the eye, the same eye when deprived of its lens and supplied with a suitable reading glass can read medium print—say Jaeger 7—over a much greater range at a greater distance; in other words, though deprived of its true accommodation, it has a pseudo-accommodation of much greater value. In this respect the highly myopic eye after removal of the lens differs widely from the emmetropic eye under similar circumstances, as after cataract extraction. In the latter the cataract glass refracts the light rays very strongly, and the angle in which they meet on the retina is relatively large; any change therefore in the distance of the object causes large diffusion circles and great loss of definition. In the case of the highly myopic eye, the reading glass required after removal of the lens is much weaker, and the angle in which the rays meet on the retina is much

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smaller. The diffusion circles are therefore small in relation to any displacement of the object, and the region of sufficiently distinct vision—pseudo-accommodation—is proportionately large.

To what degrees of myopia is the operation applicable? Fukala applies it to eyes which have a myopia of—15D. or more, and which do not tolerate correcting glasses. Thier selects—13D. as the starting point. In the list of cases given by Pergens are some of —10 and —11D. The justification for operating in these cases appears to have been a relatively bad acuteness such as would prohibit even partial correction of the myopia for reading. Fergus holds that operation is usually undesirable for myopia of less than —18D. The highest degree among Fukala's cases was —20D. He quotes a case of Schweigger's of —33D., the patient being 15 years of age.

The extent to which the refraction is lowered by the removal of the lens appears in the majority of the cases to have been from 16 to 18D. In the exceptional case above mentioned a myopia of —33D. was reduced to one of —13D., a difference of 20D.

One operator adopts the principle in all cases of operating on one eye only, partly in order to compare the future course of the myopia in the operated and non-operated eyes, partly that the patient may still use one eye without a glass for very near objects if he desire to do so. Other writers condemn this principle, for experience seems to show that the operated eye will usually be used by preference, and cases are mentioned of patients returning with the request for similar treatment of the fellow eye. Moreover, the continued use of either eye very closely on near objects is objectionable as tending to aggravation of the myopia.

As regards the ultimate effect of the operation on the progress of the myopia, it is probably premature to speak with any certainty, but Fukala states that he has watched some of his cases for years and found no increase, or no important increase of the myopia. He quotes Pilüger and Thier to the same effect.

The patients best suited for operative treatment are the young; the fortieth year is given by Fukala as the limit of age; Fergus places the limit considerably earlier; Thier somewhat later. The contra-indications are advanced age and extensive complications in the choroid threatening hæmorrhage and detachment of the retina. A moderate degree of staphyloma posticum is no contra-indication; indeed, were it so, there would be few cases available for treatment.

The method of operation is discission, followed usually at a short interval by extraction of the broken up and swollen lens. Fukala at first performed preliminary iridectomy in every case, but now reserves this for patients over 30 years of age. He advocates a thorough discission causing immediate and thorough swelling of the lens. The swollen lens substance is removed with as little delay as possible, and further extraction is performed later if necessary. The duration of the case, which might otherwise cover six months, is thus reduced to four or six weeks. Thier employs a more drastic method; using a Graefe knife, he endeavours to at once divide the lens completely through its whole thickness, including the posterior capsule. The greater the swelling the better, for the sooner can the extraction be made. If there is no thorough swelling after eight days he repeats the division of the lens in the meridian transverse to the first. He claims for this very free proceeding the advantages of a speedy result and an entire absence afterwards of capsular obstructions. He applies it to all forms of cataract demanding discission. Pflüger states that he has abandoned this method after employing it many times, because it sometimes involves prolapse of the vitreous at the time of the extraction, and this renders removal of the lens-masses difficult.

To the crucial question of risk it appears that a favourable answer may be given. The percentage of failures, even when we make allowance for the favourable light in which operators are inclined to view their own performances, is evidently very small. A large number of successful cases are given in detail, *e.g.*, by Thier and Pergens.

Pflüger states that his series of forty cases have given completely satisfactory results. Fergus, speaking of nine cases, says that he has had no mishap of serious moment. Detachment of the retina appears to be the chief rock ahead. It occurred in two out of Thier's thirty-eight cases, two years after the operation in each instance, the one patient being a man aged 41 with extensive choroidal complication and vitreous opacities, the other a woman aged 25, who in the interval had been parturient and had acquired syphilis. Meighan reports a case of detachment three months after a satisfactory result had been obtained. It would be unjust, as Fukala points out, to regard every such detachment as a consequence of the operation. The disaster has occurred hitherto in only a very small proportion of the eyes operated on, and, seeing that these eyes were all suffering from very high myopia, it is highly probable that some of them at least would have developed detachment of the retina in any case. P. S.

O. SCHIRMER (Greifswald). Investigation into the Physiology of the Size of the Pupil. *von Graefe's Arch. xl.*, 5, p. 8.

That the size of the pupil of a healthy eye depends not only on the absolute amount of light to which it is exposed—besides the influences of accommodation, convergence, and other stimuli—but also on another hitherto neglected factor, was observed by Schirmer while engaged in some previous investigations. He then noticed that when the eye was exposed to light of the same moderate intensity, the pupil was large or small according as the eye had

previously been in a bright or dark room. He considered this difference in the size of the pupil when exposed to the same absolute amount of light as due to the adaptation of the retina to light.

In order to investigate this point more accurately, experiments were arranged for the purpose of showing :—

(1) That with the same state of adaptation the pupil alters with changes in the amount of light.

(2) That with an equal amount of light the pupil alters with changes in the adaptation.

(3) That with changes in the amount of light the pupil does not alter so long as the ratio of the adaptation to the amount of light remains the same.

At the very outset of these experiments the author was met by the difficulty that the existing pupillometers were unsuitable for his purpose. It was essential that the pupillometer should be used not only for great but also for small intensities of light, and shading of the examined eye to any appreciable extent had to be avoided. Schirmer therefore constructed an apparatus for measuring the pupil by means of a rectangular glass prism, one side of which showed the image of the pupil of the eye examined to the observer, who at the same time saw, reflected by the other side of the prism, the image of a micrometer scale. These two images could be made to coincide, so that the size of the pupil could be determined accurately within a quarter of a millimetre.

The observations were made in a room with only one free window, which could be covered to any desired extent. The amount of light admitted to the room was measured in each instance by Weber's photometer in which an amyl-acetate candle, after Hefner-Altenneck, is used. Precautions were necessary in order that the observations should be carried out in light of uniform intensity. It was found that a single passing cloud often made an enormous difference, producing a strong reaction of the pupil. By fixation of a small spot at a distance of one and a-half metres, changes in the size of the pupil from varying accommodation were avoided.

Various other points have to be considered in order to obtain thoroughly reliable results: the individuals to be examined ought to be young, of normal vision, with light blue irides against which the size of the dark pupil is easily determined, and the palpebral fissure ought to be sufficiently wide to prevent the upper lid from shading the pupil in any way.

All these precautions having been attended to the eye was allowed to adapt itself to light of a certain intensity. If then the intensity was increased, the pupil contracted, if diminished it dilated. The absolute size of the pupil did not depend on the absolute intensity of the light, but on the direction in which the change was made. If, for instance, the eye was adapted for 200 metre candles (m.c.) and the light was then increased to 400 m.c., the pupil contracted. If then the eye was allowed to adapt itself to 600 m.c., and the light was then reduced to 400 m.c., the pupil dilated, the resulting size of the pupil being different for the same amount of light (400 m.c.) in the two experiments, smaller in the first and larger in the second.

Further: the eye when adapted for, e.g. 200 m.c., was suddenly exposed to 800 m.c., whereupon the pupil contracted. Exposed to this same light of 800 m.c. the pupil gradually expanded again until after a lapse of about four minutes it reached its previous size. Here, then, we have a change in the size of the pupil without a change in the intensity of the light, due to the alteration in the adaptation.

It remained to be shown that the size of the pupil is the same for various intensities of light if only the ratio of the intensity to the state of adaptation is constant. Such a case is given when the eye is maximally adapted for any given light—within certain limits, of course. The experiments made by Schirmer showed that the size of the pupil when adapted *ad maximum* is the same for all intensities between 100 m.c.—in one case 50 m.c.—and 1100 m.c.: below 100 m.c. the pupil is wider, above 1100 it is narrower. These figures are not absolute, but only approximate, inasmuch as the experiments were made in daylight, which is

always changing more or less in intensity; but they harmonise well with the investigations of Uhthoff on the influence of the intensity of light on the acuteness of vision, and also with the experience of every-day life; roughly speaking, full daylight is equivalent to about 2000 m.c., and up to this range we know that vision is perfect owing to the influence of adaptation.

This adaptation, according to Schirmer, has to be considered as a compound process consisting (1) of some hitherto unknown change in the rods and cones, (2) of the optical effect of the locomotion of the retinal pigment under the influence of light, (3) of the change in the size of the pupil. The latter process takes place most quickly, and satisfies the requirements of a rough adaptation only. That it can be replaced within wide limits by the slower adaptation of the retina is proved by the fact that adaptation, even *ad maximum*, can take place in atropinisation. It is, however, clear that the range of adaptation must be wider when both retina and pupil can co-operate; and thus we find that with an unimpaired vision up to 2000 m.c., we have a range up to 1100 m.c., where the pupil has the same size, and from 1100 to 2000 m.c., the additional adaptation of a considerably contracted pupil comes to the rescue.

With regard to the time required for the adaptation, Schirmer found that it took the pupil fifteen to twenty minutes to regain its previous size when changing from light to dark, while in a change in the opposite direction, *i.e.*, from dark to light, it only required two to four minutes.

The author sums up his results as follows:

(1) Just as changes in the intensity of light with unaltered adaptation produce a pupillary reaction, changes of adaptation in unaltered light produce a change in the size of the pupil.

(2) In maximal adaptation the size of the pupil remains the same in intensities of light ranging from 100 to 1100 m.c., apart from the influence of convergence accommodation and psychical or sensory excitation. This size might be called the "physiological" size.

(3) Leaving out of consideration the stimuli just mentioned, the size of the pupil and its changes depend on the ratio of the amount of light to the state of retinal adaptation.

In conclusion, Schirmer points out that these investigations have also a practical bearing with regard to the clinical examination and the diagnostic value of the size of the pupil. It is the "physiological" size which ought to be measured, and which, varying in various individuals, averages between $3\frac{1}{4}$ and 4 mm. In measuring the size of the pupil, the following points ought to be observed:—

(1) When examining one eye, the other ought to be completely tied up. Only in this way can differences in the size of the pupil be measured with sufficient accuracy in unilateral affections of retina or optic nerve.

(2) The light may have any intensity between 100 and 1100 m.c., but it ought to be constant.

(3) Accommodation and convergence must be eliminated by the fixation of an object about $1\frac{1}{2}$ metres distant.

(4) The eye must be given sufficient time for adaptation, *i.e.*, when coming from a darker room five minutes, when from a lighter room fifteen to twenty minutes.

(5) The pupillometer must not throw any shadow on the examined eye, either of itself or of the head of the observer.

Only observations made in this way have any value for comparison with others. Schirmer promises to give at an early date the results thus obtained in a series of cases of affections of the retina and the optic nerve.

K. G.

DANIEL van DUYSE and EDMUND BRIBOSIA.

Enophthalmos with intermittent voluntary Exophthalmos. *Archives d'Ophthalmologie*, March, 1895.

The case on which this useful paper is founded may be briefly described as follows:—D. R., aged 29, a miner, struck the right side of his face on a projecting beam in one of the galleries of a pit; there was naturally a somewhat severe ecchymosis in consequence, and for two or three months the patient suffered from a dull pain in the forehead, especially at night. About six weeks after the accident he consulted the authors as to his condition; he could no longer work, for he found that whenever he stooped down “his eye came out of his head,” he was unable to see, and had rather severe pain in the orbital region.

In the erect position there is right-sided enophthalmos—the right eye projecting only 8 mm., and the left eye 12 mm., beyond the external bony margin of the orbit. There is no wound or scar visible, and no unduly dilated vessels; the palpebral apertures are similar; the fundus shows nothing pathological; and the ocular movements are symmetrical. But whenever the patient stoops—if even for less than a minute—or exerts himself by lifting a weight, or even holds his breath for a time, the right eye slips forwards from the orbital cavity. The line of protrusion is forwards, outwards, and downwards, and when the maximum is reached the pupil abruptly dilates. It is possible to produce this protrusion also by simple compression of the jugular veins, though not to quite so high a degree. During the extreme protrusion vision is abolished, though there is diplopia at the commencement of the advance of the eye. Even when the globe is most out of place there is no vascular change visible about the disc. There is no vibration, pulsation, or bruit complained of or to be found over the orbital area.

This is evidently a case, not of aneurismal character, nor of orbital tumour, but of an abnormal condition of the

venous circulation in the orbit. Reference is made to other cases of a similar type of intermittent exophthalmos, especially to the three which have been published in the last ten years—those, viz., of Magnus, Gessner, and Sergent—and two suggestions as to the cause are offered: *first*, that a varix of the superior ophthalmic vein might be present, which, becoming distended on exertion, pressed on the other veins of the apex of the orbit and caused proptosis; and *second*, that a cyst might be present, flaccid in the erect position, but becoming distended on exertion or on any interruption to the blood return, and causing pressure on the veins.

Sergent notes several diagnostic points between the intermittent exophthalmos produced by a dilated condition of the orbital veins, and that resulting from a cavernous angioma. In the former condition, the exophthalmos is truly intermittent; in the latter there is some protrusion in any position of the head, though this may be greater or less according to the attitude. In the latter case also reduction by pressure is never complete, and instead of a sensation of fluctuation and softness, there is the impression of a spongy tissue from which the contents are slowly expressed; these angiomata also are often multiple, and sometimes pulsation or *souffle* can be made out.

Obviously there must, with this dilatation of orbital veins, be an accompanying atrophy of the cushion of fat on which the eye moves; but which is cause and which is effect? If, say the authors, the dilatation of vessels is the cause of the shrinking and atrophy of the fat, there ought to be no enophthalmos such as is seen in their own case: the atrophy ought merely to keep pace with, certainly not to exceed, the dilatation of vessels. Perhaps, however, matters may be different when the condition is the result of traumatism, for it is conceivable that then we may have to do with an absorption due to injury to trophic nerves. In their own case the authors found no wound of the orbital margin implicating soft parts, such as has been an important feature in several of the recorded cases. In certain instances a fracture of the bony wall has not improbably

been present. The view of the cases favoured by Van Duyse and Bribosia is that injury has been done to the sympathetic nerves—those which are vasomotor and trophic—and that atrophy of the fatty cushion is the primary condition, vascular dilatation, &c., more or less extensive, being entirely a secondary result. The pain experienced whenever the eye became protruded is readily accounted for by the dragging on the ciliary nerves. There were no changes in the skin of the forehead and its appendages in their case. The sudden and large dilatation of the pupil at the moment of greatest protrusion the authors account for as a reflex by way of the sympathetic.

W. G. SYM.

BIRNBACHER (Graz). A Staining Reaction of the Retina after Exposure to Light. *von Graefe's Arch.*, xl., 5, p. 1.

That the morphological elements of the retina alter their relative position on exposure to light, has been made known by the observations of various authors during the last ten years, especially by van Genderen Stort and by Engelmann. Similar to the effect of light is that of other stimuli, such as mechanical pressure, heat, toxic substances and reflex action from the cutaneous nerves.

It has further been found by Chodin and Angelucci, that the retina of frogs, when kept in the dark, has an alkaline reaction which changes to an acid reaction on exposure to light.

The investigations of Ehrlich, who found various staining reactions for the various kinds of leucocytes, suggested

to Birnbacher to inquire whether it might not be possible to find out by similar staining reactions, in what part of the retina the opto-chemical changes take place. For this purpose he experimented with the eyes of various cold blooded animals, principally the common perch (*perca fluviatilis*), which of all animals seems to have the largest cones.

The experiments were carried out with the most scrupulous care, so as to avoid as much as possible all sources of error, and to render the results comparable for retinæ kept in the dark and those exposed to light.

To obtain the "darkness" retinæ the fish were kept six hours in a dark room; then the eyeballs were dissected out by the dim light of a distant spirit lamp, and put for another six hours into a fixing fluid—generally a $3\frac{1}{2}$ per cent. solution of nitric acid, which was found most suitable. The eyes were then halved, and the posterior half cut into small fragments and washed in running water for a further period of six hours in order to get rid of the fixing fluid. Hardening was then carried out by alcohol, beginning with 50 per cent., and gradually increasing the strength to absolute alcohol.

The "lighted" retinæ were obtained from animals exposed in a white vessel to daylight; the eyeballs were then cut out in sunlight and the fixation effected in daylight. The other procedures were carefully carried out and timed in the same way as for the "darkness" retinæ. The hardened pieces were embedded in celloidin, cut, and stained in alcoholic or aqueous solutions of acid colours, such as eosine, fuchsine, violet and aurantia, freed from superfluous colour by strong alcohol, cleared in oil of cloves, and finally mounted in damar.

Sections of retinæ when treated thus showed under the microscope remarkable and constant differences according as they had been exposed to light or kept in darkness during life. Apart from the changes, already known, of the relative position of certain of the morphological elements of the retina it was found that the retinæ which had been exposed to light, showed only a faint yellow

stain with eosine, while in the "darkness" retinae the cones were stained of a bright rose colour; when treated with fuchsine, they were cherry-coloured, with violet, blue, and with aurantia, yellow.

When the colour-mixture of Biondi-Heidenhain was used, the cones were stained green after exposure to light, and yellow when they had been kept in darkness. This differential staining was as constant as any ordinary chemical reaction.

From these observations it is evident that the chemical condition of the cones is altered by exposure to light.

Whether this opto-chemical process takes place in the cones themselves or in some adjacent parts, *e.g.*, in the pigment epithelium, remains thus far an open question; but Birnbacher's observation is quite in harmony with that of Angelucci, that the retina after exposure to light is acid, after rest in the dark alkaline. In the latter case we should expect *a priori* a greater affinity for acid stains, such as Birnbacher has actually found in his investigations. The author, who has only the limited means of a small laboratory at his disposal, opens the question whether a similar change in the chemical behaviour of the cones would be produced after stimulations other than that of light, as mentioned in the beginning; and he further points out the desirability of examining the influence of various pairs of contrast colours, whereby possibly an experimental support for the colour-theory of Hering might be gained.

K. G.

A. GRUNTHAL (Beuthen). A Contribution to the Record of Cases of Foreign Bodies in the Interior of the Eye. *Berlin. Klin. Wochenschrift, January 28, 1895.*

Although the record of cases of the presence of foreign bodies within the eye is considerable, and has increased much since the introduction of the electro-magnet into ophthalmic practice, it may yet be permissible on account of the importance attaching to the subject to add to them. "An exact account of the injury, as well as of the treatment and the result," so says Schwarzbach, speaking of foreign bodies generally, "if conscientiously noted and published by the surgeon, would enable future statistics to furnish precise data as to the best time for operation and the value of operations which to-day are dependent on the views of individual surgeons, and thus subject to fluctuation and doubt." These conclusions of Schwarzbach's must in the main still be upheld, although a large step in advance has been taken in the treatment of such foreign bodies since the electro-magnet has found a place in it.

The following cases from the author's practice are reported by him as of interest, partly for diagnostic and therapeutic reasons, and partly on account of their rarity:

**A.—FOREIGN BODIES IN THE ANTERIOR CHAMBER,
AND IN THE IRIS.**

(1) L., wife of a workman, 36 years of age, presented herself on March 11, 1887, stating that whilst cooking some fat a porcelain pot had cracked, and something flown into her left eye. The left eye is somewhat markedly injected. In the inner and lower quadrant of the cornea, near its margin, is an oblique wound in direction downwards and outwards, and of about 2 mm. length. The cornea in the upper $\frac{1}{3}$ and in the centre presents a greyish haziness, due undoubtedly to a slight superficial scald produced by the hot fat. The anterior chamber is intact. In its lowest part is seen a white body the size of a millet seed,

and close to it on its inner side a smaller one of the same colour. The appearance of the fundus is veiled owing to the opacity of the cornea. Tension somewhat under normal. V. with $-7 \frac{20}{60}$. With a Graefe's knife a peripheral linear incision was made downwards. The aqueous escaped. The foreign bodies were now no longer visible. A light compress was applied, and the aqueous in a few minutes had collected afresh. The foreign bodies were again visible at the bottom of the chamber. By a careful introduction of forceps it was possible to remove the larger piece, and the smaller after allowing the aqueous to collect again. A prolapsed piece of iris was removed. The healing process was uninterrupted, patient being discharged on the sixth day. V. with $-9 = \frac{16}{50}$. Six months later no symptoms of irritation. V. as before.

(2) H. P., aged 16, smith's apprentice. This case was one of a chip of steel in the iris without injury to lens. The foreign body was removed by the magnet.

(3) A. D., blacksmith, aged 35. This case was not of special interest. There was a foreign body both on the cornea and in the iris. The portion of iris containing the spicule of iron had ultimately to be excised, as removal by the magnet failed. The case did well.

(4) B. J., 32 years, factory hand, applied on Sept. 13, 1887. Says his right eye had been red for several days, and that he had pain in it. Strong injection of conj. bulbi. By careful inspection of cornea a linear, vertical scar is seen in the lower, inner quadrant; iris somewhat hyperæmic and slightly discoloured; lens and vitreous quite clear; fundus, &c., normal. Since the scar in the cornea raised the suspicion that a foreign body was present—although patient remembers nothing getting into his eye—atropine was instilled. This showed a posterior synechia below and inwards; otherwise complete mydriasis. No foreign substance to be seen. Patient was treated with atropine. Injection decreased; synechia continued. Sept. 28, the following notes were taken: Bulbus slightly injected; scar previously described visible on the cornea, synechia persists. Now, however, is to be seen in the lower, inner

quadrant of the iris about 4 mm. from the pupillary margin, and corresponding to the corneal scar, a small brown body, whose point projects into the anterior chamber. Lens, vitreous and fundus normal as before. On closely questioning the patient, he now admits that four weeks ago while pouring water into hot slag, some had spurted into his eye ; but he had taken no notice as there was no pain. The foreign body, therefore, had been already four weeks in the iris, and had, since nothing could be seen of it during the first period of observation, penetrated into the deepest portions of the tissues of the iris. This was also made clear by a linear injury of the anterior capsule of the lens, which was visible later on removal of the affected piece of the iris. In time it had passed forward through the tissues of the iris. A piece of the iris holding the foreign body was excised. A week later there was still slight injection of the eye. Within the coloboma could be seen a scar on the anterior capsule of the lens, slightly below the point of injury in the cornea, of about 3 mm. length and in direction from within and above, downwards and outwards. S. with $—0.75 \frac{6}{8-6}$. In another week the eye was free from all irritation.

(5) Workman K., 45 years old, when cutting a tube on Dec. 28, 1889, received a splinter in his right eye. About an hour after injury a vertical perforating incision in the cornea, about 7 mm. long and corresponding nearly to the outer edge of the pupil, was noticed. The iris is adherent to the wound. In the outer part of the iris itself there is a horizontal tear running right across it. Lying on the upper part of the iris is an eyelash which with its point reaches the transverse tear. There is traumatic cataract. T. — 1 ; S. = fingers when near. Next day the anterior chamber was almost completely restored and the eyelash was now in contact with the posterior surface of the cornea. Jan 2, 1890, cataract maturing ; eyelash as before ; eye fairly free from irritation. Feb. 23, 1890, cataract not yet ripe ; eyelash as before, without having produced any irritative symptoms. Towards the end of July cataract mature. No irritative symptoms to date. Aug. 3, peri-

pheral linear extraction upwards. Cataract easily delivered, consists of a pulpy cortex, and a small nucleus. In passing through the wound it entangled the eyelash, which was removed with it. Some cortical remains were left in the pupillary area. Sept. 4, cortical remains have been completely absorbed, so that the pupillary area is quite free. V. with $+ 12.0 = \frac{6}{12}$.

Foreign bodies in the anterior chamber and iris are often borne for years without provoking irritation. Blessing has collected several. Seggel also describes a case of the kind. This condition of things has most frequently been observed to obtain in the case of eyelashes. In the author's case the eyelash had remained seven months *in situ* without causing reaction. Graefe has described a case where it remained ten years. Samuelson has observed an instance of total absorption and one of partial absorption of an eyelash in the anterior chamber. From Frank's collection of cases, however, it is proved on the other hand that most serious changes may occur in the affected eye. It is, therefore, usually well to attempt removal of any foreign body within the anterior chamber or iris.

B.—FOREIGN BODIES IN THE LENS.

Full notes of two such cases are given. In both a chip of iron was lodged in the lens, but the eyes remained free from irritation. The same method of treatment was adopted in each case, viz., that of allowing the cataract to mature during a period of several months, and then extracting the lens with the contained foreign body. Both cases did well and got good vision.

In the treatment of such cases Knapp recommends that maturation of the cataract should be allowed to proceed, and the extraction of the cataract undertaken when the the most favourable moment has arrived. Weidmann's statistical grouping of cases shows that results are not always good. In 1,322 cases of injuries with foreign bodies present in the eye, he finds no case of loss of the eye in consequence of the presence of the body within the anterior

chamber or iris, whereas foreign bodies in the lens were followed by loss of the eye in 30·76 per cent. Extraction of spicula of iron from the lens by means of the magnet is not infrequent. Neese reports 13 cases of foreign bodies in the lens, in 12 of which it was possible to remove the body by the magnet. He considers this method of removing iron spicula from the lens as particularly appropriate, because it is possible thus to remove the spiculum from the loose structure of the lens without resistance, and with less chance of forcing it back into the vitreous than by other means. Haab succeeded in extracting an iron spicule which was sticking in the posterior layers of the lens, and projecting thence for about 1 mm. into the vitreous, by means of a very strong magnet; it was first got into the anterior chamber by this means, and then easily removed thence.

C.—FOREIGN BODIES IN THE VITREOUS.

(1) J. J., shopkeeper, aged 25. History of injury to the left eye ten years ago when a boy of 15. He had been playing tricks with gunpowder in a glass bottle, with the result that the bottle burst and a splinter of glass entered his eye. The eye had never been inflamed or painful, but he frequently had the sensation of a shadow before the eye. V.: R. with $+1\cdot5 = \frac{20}{40}$; L. with $-1 = \frac{20}{100}$. On the left side slight strabismus divergens and conjunctivitis. By lateral illumination, a linear scar, somewhat above the middle of the cornea. After atropine mydriasis on the anterior lens capsule at the junction of middle and outer $\frac{1}{3}$, and corresponding to the height of the corneal scar, a white opacity the size of a pin head. Slightly outward from this point on the posterior capsule a similar sized opacity of the like colour. The remainder of the lens clear. With the ophthalmoscope in erect image a bright shining body is seen floating in the lower part of the vitreous. The body reflects brilliantly and appears to lie in front of the equator. When seen with the inverted image from above it looks like a bright shining beam in front of the equator. A few floating opacities visible in the remainder of the vitreous. The

papilla is very faintly veiled. The field of vision in its upper part is somewhat restricted. Here, then, we have to deal with a case where a splinter of glass has remained in the vitreous for ten years, without having called forth any reaction, and with preservation of comparatively good sight.

(2) F. L., aged 39, was struck on the left eye on May 1, 1887, by a piece of cast iron. The protective glass he was wearing at the time was broken. An hour after injury the following condition was observed. Left eye strongly injected and photophobic. A perforating wound of the sclerotic, 2-3 mm. in length close to the corneal border; large hyphæma, which reaches to the lower part of the pupil; pupil narrow and reacts feebly. Atropine produces moderate mydriasis. With the ophthalmoscope numerous floating opacities of the vitreous. In the upper part of the vitreous occasionally a bright shining body is seen. Papilla slightly veiled. V. = fingers quite near. T. subnormal. Right eye normal. Treatment, atropine and compress. On the 2nd, vitreous opacities decreased. Red light from all parts of the fundus. Hyphæma less. The bright body in the vitreous more distinctly visible. Changes its position but slightly with movements of the eye; always remaining in the upper part of vitreous. Is round in form, transparent at the centre with darker contours. Position, form, &c., all go to prove that it is an air bubble. No metallic body visible with the ophthalmoscope. On May 3, marked injection of bulbus with commencing chemosis; aqueous clouded; exudation in pupillary area; hyphæma still present; pupil narrow; no dilation with atropine; no red glow with ophthalmoscope. Light sense and projection good. May 4, small hypopyon; 5th, hypopyon larger; 10th, exudation in pupil, area being absorbed, hypopyon decreasing; 13th, hypopyon and exudation absorbed, commencing infiltration of vitreous (grey reflex in depth), counts fingers in an uncertain way close at hand; 18th, infiltration of vitreous increased and beginning vascularisation of vitreous; no red glow with ophthalmoscope. T. slightly minus; light sense—only a medium lump. Projection good. Eye free from irritation.

Communications on the presence of air bubbles in the vitreous are sparingly met with in literature, although the entrance of air into the vitreous may be assumed not to be very uncommon. Pfalz describes a case very similar to the above. Beside the air bubble, which at first simulated the presence of an iron chip, there was a spicule present, which was extracted with Hirschberg's magnet. Hirschberg mentions another case in his work on the use of the magnet in ophthalmology. In this three air bubbles were observed close together in the upper part of the vitreous, but disappeared in the course of three days. Here, however, there was also present a metallic substance in the retina. The eye, after an ineffectual effort to remove this substance, had to be enucleated.

M. R. J. BEHRENDT.

H. FRIEDENWALD (Baltimore). Ante-partum Ophthalmia Neonatorum. *Medical News*, March 9, 1895.

Ophthalmia neonatorum develops, as a rule, on the second or third day after birth. Infection usually occurs during the passage of the child's head through the vagina. The intervening time is known as the period of incubation, during which the eye presents no signs of disease. This period lasts at least twenty-four hours. Yet there are cases of children born with well-marked signs of this disease, the period of incubation having passed, and the stage of inflammation being more or less advanced at birth.

Friedenwald reports one case of his own, and one from the practice of another physician, with abstracts of eighteen cases—all he was able to collect after a careful search in medical literature.

Friedenwald's case occurred at the Baltimore "Maternité." The mother had been in labour two days. The membranes broke at 6.15 a.m., and the child was delivered at 9 a.m. the same day. Silver nitrate (2 per cent.) was instilled immediately. Within an hour after birth, when the child was washed, the nurse noticed that there was pus in the eyes, and called the attention of the resident physician to it. When Friedenwald saw it the next day, the eyes were discharging yellowish fluid, there was much swelling, and corneal opacity, but no ulcers. Large opacities of both corneæ resulted.

In the case occurring in the practice of Dr. Edith Eareckson, the child was born by face presentation fifteen hours after the membranes had ruptured. At birth the eyelids were much swollen and tightly closed, and when forced open, muco-pus spurted out. The final result in this case was not known.

As to the time of infection, Friedenwald thinks it occurred probably soon after the rupture of the membranes, the infectious material being carried in most cases by the finger of the examining physician or midwife. In seven cases the rupture occurred more than forty-eight hours before birth; in seven the time is not stated; in three it occurred from fifteen to nineteen hours before birth; in one, reported by Bellouard, it took place within eight hours; in Friedenwald's own case within three hours; and in one, reported by Haussmann, it is said to have occurred shortly before delivery.

Bellouard thought that there was a lateral rupture of the membranes, sufficiently large to admit the entrance of the poison, but not permitting the entire fluid to escape. This explanation Friedenwald is inclined to accept, thinking it likely that there was an earlier rupture of the membranes with a partial discharge of fluid. He is unwilling to accept the explanation of Haussmann, also assumed by Niden, that the poison passed through the unbroken membranes.

As would be expected, the infection, occurring at varying lengths of time before delivery, the inflammation was found in different stages of development at birth. In some

the inflammation first showed itself a few hours afterwards, and in one the eyes were completely destroyed at birth. The number of eyes lost by corneal involvement was large. The result is stated in fourteen cases; in five the cornea escaped, in nine corneal opacities resulted. Friedenwald attributes the virulence of these cases to prolonged contact of the eyes with the poison. With regard to prophylaxis, the application of Credé's method appears to be of service in those cases only in which the infection was very recent. Vaginal injections and irrigations of mercuric chloride [1 : 2000], and carbolic acid $1\frac{1}{2}$ per cent.; and even applications of mercuric chloride [1 : 100], and silver nitrate [1 : 100] were used in some of the cases without preventing the disease.

[The now well-known liability of the uterus to chronic gonorrhœal disease adds to the probability of the mode of infection suggested by Bellouard, and renders it unnecessary to invoke the aid of the examining finger in the process, though it may participate. Might not some of these cases be partly accounted for by the unusually rapid development that often occurs in the malignant cases of an infectious disease? This would also explain their severity.—E. J.]

R. L. RANDOLPH (Baltimore). A Suggestion as to the Treatment of Penetrating Wounds of the Ciliary Region and Lens. *New York Medical Journal*, February 23, 1895.

Such wounds constitute most dangerous injuries to the eye. Sympathetic ophthalmia usually originates in such an injury, and the fear of this induces the surgeon to remove the injured eye at once. Randolph claims that in these cases where usually enucleation is performed, the removal of the lens will often be followed by the recovery of comparatively useful vision.

Practically all wounds are infected, if not by the foreign body, then later by the entrance of organisms through the passage made by it. There is no more favourable place in the eye for the lodgment and development of organisms than in the space between the iris and lens, and particularly in that part of the space where the ciliary processes project. Here we usually find the point of injury, and from this point the microbes readily develop and can soon involve all parts of the eye. In many of these wounds the lens is injured, and its swelling and pressure aggravate the inflammation. He would, therefore, remove the lens, which really acts as a foreign body, and with it the infectious contents of the ciliary region—the operation having very much the effect of opening an abscess.

The time to perform the extraction is in the first week after injury, when sympathetic ophthalmia is too remote a contingency to outweigh every other consideration. Waiting for further developments means, ultimately, enucleation. The longer we wait the more complete become the adhesions between the anterior capsule and the iris. An exudation spreads out over the posterior surface of the iris, the capsule of the lens and the ciliary processes; and later on this exudation is replaced by a membrane that serves to enfold entirely this part of the eye and transform it ultimately into a mass of disorganised tissue. In this stage it is impossible to remove the lens, and even difficult to perform an iridectomy.

The cases that are particularly well adapted to this method of treatment are those where the wound is small and situated at the corneo-scleral junction. In such cases the wound is easily enlarged and presents the most natural point for the egress of the lens.

Unless the subsequent improvement is rapid enucleation should not be delayed. Randolph reports cases in which useful vision was secured by this method.

E. J.

SHORT NOTES OF A CASE OF NATURAL CURE OF PTERYGIUM.

BY KENNETH SCOTT, CAIRO, EGYPT.

THIS rather peculiar and unusual case came under my observation a short time ago. The patient was a woman, 45 years old, and very intelligent. She came to me on account of her left eye, the cornea of which had a dense central leucoma.

In the right eye there was a slight depression of irregular shape at the corneal centre, the involved portion being quite free from any opacity. The inner border of this depression was formed by the remains of what had been a pterygium, situated at the inner side of the eye. This superfluous tissue just crossed the corneal margin, and its appearance was such as to suggest that the pterygium had been cut through transversely and its terminal portion removed.

The actual measurements were the following:—The extreme base, at 1 mm. distance from the corneal margin, measured 9 mm. across; the truncated termination extended 3 mm. over the cornea, and there measured 4 mm. across. The imaginary prolongation of the sides, connecting the pterygium with its former apex, gave it an extension of 7 or 8 mm. over the surface of the cornea, whose whole diameter was 13

mm. ; the growth, therefore, had probably covered, and extended beyond, the centre of the cornea.

The growth was no longer active and fleshy, but had become thin and pallid, resembling ordinary conjunctival tissue.

The woman's statement was to the effect that, during the preceding ten years, her eyesight had been gradually growing dimmer, until some eight months or so before she consulted me, when the eye became acutely painful and inflamed. On recovery she found that her sight was almost as good as it had ever been.

The process of ulceration had evidently done little more than destroy the tissue of the pterygium, and only affected the corneal surface slightly.

No operation had, at any time, been performed on her eye.

ROHMER (Nancy). The Effects of Lightning-Stroke upon the Visual Apparatus. *Archives d'Ophthal.*, April, 1895.

Apropos of a case under his own care, Rohmer has studied the literature of this subject, and in the present article notices nearly all the previously published cases. He then discusses the pathogenesis of the various ocular lesions resulting from lightning stroke, comparing them with those induced by artificial electric light, and finally mentions the methods of treatment which have been recommended or adopted.

Passing over burns of the eyelids, which do not differ from cutaneous lesions elsewhere, the conditions first considered by Rohmer, are nervous and muscular lesions, such as

spasm or paralysis of extrinsic and intrinsic ocular muscles. In nearly all reported cases, the lesions induced by lightning are accompanied by blepharo-spasm (Little, Purtscher, Vossius), by contraction of pupils and spasm of accommodation, or more frequently by paralytic phenomena, such as temporary ptosis (Pagenstecher, Uhde, Knies), paralysis of internal rectus, or of ciliary muscle and sphincter of iris. Little's case occurred in a man, aged 56, who was struck down by lightning, but did not lose consciousness. Severe blepharo-spasm ensued, which lasted for thirteen days.¹ The condition was attributed by Little to fright.

The *conjunctiva* is often the seat of lesions analogous to those produced in the skin; it is to be remembered, however, that in cases in which serious damage accrues to the deeper parts of the eye, there may be no conjunctival irritation.

The *cornea* has occasionally been slightly affected, but always without permanent damage. Vossius records a case in which there was some superficial (probably epithelial) destruction, and Silex reports the case of a child in whose cornea there were numerous small punctate and linear opacities, which rapidly disappeared. Vossius has noted a case of superficial (epithelial) destruction of both corneæ by lightning.

Rohmer has found but one observation of *irido-cyclitis* resulting from lightning-stroke. The patient, who was under Vossius' care,² was struck by lightning and was unconscious for two hours. He was soon afterwards brought to the hospital, and was then suffering *inter alia* from superficial burn of the right cornea, spasm of accommodation, and severe photophobia. This eye was subsequently the seat of a relapsing irido-cyclitis and slight optic neuritis resulting in partial atrophy, and a posterior polar cataract developed, which remained stationary. There was no evidence of rupture of lens capsule.

¹ OPTHALMIC REVIEW, vol. ii., 1883.

² *Centralbl. f. Prakt. Augenheilk.*, June, 1886.

Doubt has been expressed by some writers as to the causal relation which Vossius believed to exist between the lightning stroke and the attack of irido-cyclitis in this case.

Lesions of the *crystalline lens* are, with those of the retina and optic nerve, the most frequently observed ocular results of lightning stroke. Rohmer refers to nine reported cases of cataract following, and thought to be caused by, this accident, and another in which the lens opacity appeared to be secondary to an irido-cyclitis occurring in a patient struck by lightning. The nine cases are by Fage, Brisseau, Rivaud-Landreau, Servais, Downar, Leber, Pagenstecher, Laker and Meyhofer.¹ The last may be given as an example. A woman, aged 30, was knocked down by lightning and remained stunned for twenty-four hours. On recovering she had, in addition to unilateral motor and sensory nerve disturbance, violent photophobia and burning pain in the eyes. From the second day after the accident she noticed dimness of sight in the left eye. A month later there was dense opacity of the anterior and posterior capsule of the left lens in its upper half, the lower half remaining transparent. The anterior and posterior cortical layers on the affected part showed numerous minute punctate opacities. Fundus oculi normal.

Six cases (including his own) of the effect of lightning upon the *retina and optic nerve* are mentioned by Rohmer. The first of these by Ivanoff, occurring in a girl, aged 19, is so probably hysterical in nature that it should be eliminated. The other cases by Uhde, Knies, Laker and Büller, are given in abstract. Rohmer's case was that of a boy, aged 12½, who was walking along a road during a thunderstorm, when a tree, a few paces from him, was struck by lightning. He fell and remained unconscious for a short time, but was subsequently able to walk to a house near by. No defect of sight was noticed. The

¹ Meyhofer, *Klin. Monatsbl. f. Augenheilk.*, Sept., 1886.

after history is that of recurrent severe headache, with tremors and loss of power in the legs severe enough to make walking impossible, and gradual failure of vision. When seen by Rohmer, nearly two years after the injury, there was atrophy of both optic nerves, with colour blindness and slight contraction of fields; vision was reduced to ability to count fingers at 70 cm. with the better (right) eye. (The long interval between the lightning stroke and the onset of failure of vision in this case seems to throw some doubt upon the causation of the optic nerve disease.)

In Laker's case a man was struck by lightning while at a window. He was rendered unconscious for an unknown period, and on recovery, was blind for the space of one week. Vision then slowly returned; at the end of a fortnight it was in the R. $\frac{6}{60}$ and in the L. $\frac{3}{60}$, and no further improvement occurred. Ophthalmoscopic examination revealed neuro-retinitis with retinal hæmorrhage and slight opacity of lenses.

Pathogenesis.—Rohmer thinks that there is a striking analogy between the ocular lesions caused by lightning stroke, and those due to electric light; in the slighter cases the symptoms of conjunctival irritation, with perhaps swelling of lids, and a dilated or contracted pupil, are met with in both groups. In instances of severe "electric ophthalmia" retinal symptoms are the most noticeable; sight is diminished or abolished, a central scotoma observed, and subsequently a sensation of numerous small foreign particles in the conjunctival sac, accompanied by lachrymation and blepharo-spasm, occurs. These symptoms usually subside in twenty-four or forty-eight hours, without much damage to the eye, although the persistence of defect of vision has been noted. All these symptoms have also been observed in cases of lightning stroke.

What is the exact causation of the changes, whether induced by lightning or by artificial electric flash?

The electric arc includes heat rays, chemical or actinic, and luminous rays; of these the first named may at once be eliminated as in no way responsible for ocular lesions.

Opinions vary as to the remaining two groups of rays; Martin maintains that the light rays are alone injurious, and to support his opinion, calls attention to the ocular lesions induced by other forms of intense light, *e.g.*, eclipse-blindness, snow-blindness, and the like. Emrys Jones, who agrees with Martin's view, has noted that in electric lighting, too strong a current producing a violet light, or too weak a current producing orange light, is less harmful than a white or nearly white light, and also that an intermittent is more dangerous than a constant light. Foucault, Regnault, Charcot and Maklakoff, on the contrary, hold that the violet and ultra-violet rays are the cause of the eye symptoms. The latter states that the voltaic arc is poor in calorific rays, and has a preponderance of chemical rays; Terrier in this connection, asks why accidents should still happen to workmen engaged in electric work, since the violet and ultra-violet rays are excluded by protective glasses tinted with uranium salts.

The temporary paralysis of oculo-motor nerves, and of the optic nerve are ascribed to the direct effect of electricity upon the nerves; *i.e.*, to a peripheral rather than to a central lesion.

The production of cataract by lightning stroke has been variously explained; Leber holds that it is the direct result of a physico-chemical action of the lightning; Vossius thinks the cataract is usually secondary to irido-cyclitis. Silex suggests that the appearance of opacities in the lens is due to coagulation of albuminous fluid, by the catalytic action of the electric discharge; in his case alone the opacities disappeared.

In Hess's¹ experiments on rabbits, the cataracts were explained by the more or less complete destruction of the intra-capsular epithelium; this explanation, however, does not seem applicable to the cases of cataract following lightning stroke.

Treatment.—Under this heading but little need be said. Slight cutaneous burns require no special treatment. Cold

¹ *Arch. d'Ophthal.*, viii., p. 466, 1888.

applications were found useful and comforting by Maklakoff, who had occasion to resort to them for himself, and Purtscher also commends them. For conjunctival irritation, cocaine, which was expected to be serviceable, is reported by Maklakoff to have aggravated all the symptoms, whereas atropine allayed the irritation and photophobia. Mild astringent applications have sometimes proved efficacious.

Treatment in the case of optic nerve and retinal lesions has been of little avail. The slighter cases recover spontaneously, the severe cases appear to be uninfluenced by the drugs which have been used. Lactate of zinc (Boé), antipyrine injected subcutaneously (Rohmer), nux vomica (Uhde), have been tried, but without encouraging results. In a case under Uhde's care, inhalations of nitrite of amyl, and the application of eserine produced an evanescent improvement in vision.

J. B. L.

C. S. BULL (New York). Recent Experiences in the Treatment of Detached Retina, with a detailed Report of Thirty-eight Cases. *Reprinted from American Ophthalmological Society's Transactions*, 1894.

This paper deserves a longer notice than the short paragraph in a previous number of this journal,¹ which refers to it, amongst the other papers of the American Ophthalmological Society of 1894. The number of cases on which the author's conclusions are based is thirty-eight, twenty-three of these being men and fifteen women. The ages of his patients range from nineteen to seventy-four, and are very evenly distributed over this interval, that is, each decade claims approximately the same number of cases.

¹ OPHTHAL. REV., vol. xiii., p. 302.

Simple myopia was the error of refraction in twenty-two cases and in one case there was simple myopic astigmatism, the rest were nearly equally divided between hypermetropia and emmetropia. The retinal detachment occurred spontaneously in thirty cases and in eight was due to traumatism. There was tolerably extensive hæmorrhage into the retina, preceding the detachment, on several occasions and hæmorrhage into the vitreous rather more frequently. Laceration of the retina, allowing a distinct view of the choroid through the rent, occurred six times. Intra-ocular tension was normal in fifteen, sub-normal in twenty and increased in three cases. More or less marked degeneration of the choroid with interstitial atrophy was observed in twenty-two instances. Acute choroiditis occurred only once. The retina subsequently became totally detached in nine cases, either during the time of treatment or at a varying period after the treatment had been concluded. Complete opacity of the lens took place nineteen times. It is interesting to note that in one case extraction of a cataractous lens with iridectomy was performed before any treatment was adopted for the detached retina, and the result was excellent. The wound healed rapidly, the coloboma remained unobstructed, no discission was subsequently necessary, and no increase of or bad effect on the retinal detachment could be made out. In another case an iridectomy upwards had been performed without producing any apparent effect on the detachment.

All the cases were subjected to the same line of treatment. The patients were placed on their backs in bed, atropine was used for one or both eyes, according to the requirements of the individual case, and a bandage was applied to the affected eye. This treatment was kept up for a period of from three to eight weeks. Hydrochlorate of pilocarpine was injected hypodermically in twenty-five cases, one injection being given each day, but in several instances it produced such alarming results that the author was obliged to discontinue it. His experience of this drug has led him to avoid its use in persons suffering from functional or organic heart disease. Where pilocarpine

was not borne well small doses of sodium bicarbonate and iodide of potassium, largely diluted, were given, the intention being to promote free action of the kidneys and bowels. In cases of iritis and choroiditis, and in all cases of extensive opacities of the vitreous, corrosive sublimate in small doses was administered.

Puncture of the eyeball through the sclera into the subretinal space was performed in nineteen cases, the method in every instance being subconjunctival. Division of membranous bands in the vitreous and of the detached retina, with a view to allowing the subretinal fluid to escape into the vitreous, was done seven times.

We give the results of this method of treatment in the author's own words. "There was a temporary improvement in the vision and the detached retina, varying from a few weeks to several years before the vision became reduced, and the detachment increased in extent in twenty-three cases. There was no improvement whatever in eleven cases. There was an apparent permanent cure with entire disappearance of the detachment and restoration of useful vision in four cases."

Very little, if any, reaction followed puncture of the eyeball through the sclera, or the division of the detached retina and the membranous bands in the vitreous in any of the cases. Bull has already referred to this fact in two previous papers on the surgical treatment of membranous opacities of the vitreous.¹

The author's conclusions briefly summed up and condensed are as follows:—

(1) No better means for dealing with detachment of the retina has yet been discovered than the old one, which has been in vogue for so many years, viz., rest on the back in bed, atropine, a bandage, and internal administrations of some drug which may induce absorption of the subretinal fluid.

(2) The continued use of pilocarpine, either hypoder-

¹ *Transactions of American Ophthalmological Society*, 1888, and *OPHTHALMIC REVIEW*, vol. ix., p. 101.

mically or by the mouth, may cause great prostration even in cases in which it seems to be tolerated well, and the desired effect may sometimes be produced by small doses of bicarbonate of soda and iodide of potassium largely diluted with water.

(3) In all recent cases temporary benefit to vision may be gained by subconjunctival puncture of the sclera, which allows the subretinal fluid to escape and the retina to fall back more or less into its normal position, but the improvement is generally transient, and when membranous bands exist in the vitreous no improvement can be expected from simple puncture.

(4) Little reaction is to be anticipated from division of fixed membranous opacities in the vitreous. This procedure may do good even without division of the detached retina, as it reduces the danger of extension of the detachment. It is positively contra-indicated in cases where the vitreous opacity is vascularised, as it would then certainly induce free hæmorrhage into the vitreous. It is hardly necessary to add that it is not a permissible operation when the eye is irritated or inflamed.

(5) Division of the detached retina, which allows the subretinal fluid to escape into the vitreous chamber, may always be practised on a quiet eye, and under such conditions cause little or no reaction. If membranous bands are present in the vitreous these should also be divided at the same time.

(6) In the majority of cases only temporary improvement is attained by all these operative procedures, and it not infrequently happens that no effect whatever is gained by them.

(7) In the author's opinion it is unnecessary to investigate further the method of treatment of this disease advocated some years ago by Schöler. Bull would reject it from the domain of ophthalmic surgery.

It is impossible here to refer individually to all the cases of which our author gives full notes, nor would there be any advantage in doing so even if space permitted, but we may be allowed to refer shortly to one instance of

marked improvement under apparently well-nigh hopeless conditions. E. S., aged 50, first seen July 3, 1885. Has been myopic from childhood. When 20 years old, after a long illness, she suddenly lost the sight of both eyes from what was thought to be extensive hæmorrhage into the retina and vitreous. Useful vision slowly returned in the left eye, but the right remained very defective. In May, 1885, she suddenly noticed a large dark spot on the temporal side of the field of the L. Examination on July 3 showed the following conditions:—R. vision = fingers at six feet eccentrically, unimproved; vitreous hazy, lens clear. Extensive old retino-choroiditis disseminata more marked in region of macula and disc. Atrophy of optic nerve, retinal detachment downwards and outwards. L. vision = $\frac{10}{100}$; with -- 4.5D. sph. = $\frac{18}{30}$, somewhat eccentrically. Faint peripheral lenticular opacities; general disseminated retino-choroiditis; vitreous clear; small detachment of the retina at the extreme nasal side of the fundus.

Considering the condition of the fundus, Bull not unreasonably looked on the case as hopeless, but the patient was put to bed, atropine instilled into both eyes, and a bandage applied to the left. Pilocarpine being contra-indicated, owing to functional cardiac trouble, small doses of potassium iodide largely diluted were given, which acted freely on the kidneys and to a less extent on the bowels also. Much to the author's surprise the detachment in the left eye slowly receded, and by the end of three weeks had disappeared. The vitreous cleared up, and vision, with a correcting glass, rose to $\frac{18}{30}$, at which point it has since remained, *i.e.*, for a period of nearly nine years. The patient has been seen from time to time ever since and the vision and fundus have shown little or no change.

N. M. ML.

LUDWIG BACH (Wurzburg). Tubercular Infection of the Eye. *Archives of Ophthalm.*, xxiv., 1.

In contra-distinction to the general opinion expressed in ophthalmic text-books that tuberculosis is a rare affection of the eye and its appendages, the author holds that this disease attacks the eye much more frequently than is supposed. He refers to the fact that Michel has for years asserted this, more particularly with reference to tubercle of the uveal tract.

At the outset Bach lays down the four following axioms, all of which, except perhaps the first, will probably be accepted without demur by most ophthalmic surgeons:—

(1) Tuberculosis of the eye is by no means a rare affection.

(2) All parts of the eye may be attacked by the disease.

(3) It plays a particularly important rôle in diseases of the uveal tract.

(4) The eye disease may be the only and earliest manifestation of the tuberculous infection.

The clinical diagnosis of tubercle of the lids has in Bach's experience been several times confirmed by the transplantation of some part of the diseased lid into the anterior chamber of a rabbit. He has occasionally observed lupus of the lid occurring either separately as an isolated affection or as having extended from some part of the nose or cheeks affected with this disease. In a few rare instances he believes that the so-called chalazion consists of tuberculous granulation tissue, and lastly he has seen an example of diffuse tuberculosis of the lid as instanced by the following case:

A boy, aged 7, came to the clinic with almost complete ptosis on the right side. The upper lid was swollen, and was peculiarly soft and spongy to the touch. Only in a small portion towards the inner end was the tarsus at all normal to palpation. The skin of the upper lid appeared to be perfectly healthy. The tarsal conjunctiva, as well as the retro-tarsal fold, was succulent and swollen, and re-

sembled granulation tissue. A moderate amount of conjunctival mucous secretion was observed. A piece of the diseased tarsal tissue was removed and examined microscopically. A piece also was transplanted into the anterior chamber of a rabbit; four weeks later typical tubercular disease had established itself and large numbers of tubercle bacilli were found under the microscope.

As an example of conjunctival tuberculosis we may quote the following case:—

A girl, 14 years old, came to Bach, complaining of the condition of her left eye, which had been troubling her for several weeks. The left lower lid, chiefly on the nasal side, was thickened and inflamed. Slight eversion of the border of the lid had occurred. Not far from its margin there was an ulcer with elevated irregular borders. A portion was excised and transplanted, with the result that the diagnosis of tubercle was confirmed. The ulcer healed after it had been cauterised. There was no ground, either from its history or character, to suspect syphilis, and iodide of potassium, although tried, proved of no avail.

The next part of the paper is devoted to an elaborate account of what he regards as a classical case of tubercular disease of the eye and its appendages. The clinical condition was very briefly as follows: V. = hand reflex, but only when the hand was held close to the face; marked circum-corneal injection; diffuse parenchymatous clouding of the cornea, with vascularisation of the latter; anterior chamber shallow and iris discoloured; the pupil was closed by connective tissue. Tension diminished, and the globe was excessively sensitive, even to the lightest touch. Bacteriological examination failed to detect tubercle bacilli, but transplantation gave confirmatory evidence of the tubercular nature of the disease. Pathological examination showed infiltration by tubercle throughout the tissues of the eye.

Tubercular disease of the uveal tract may, the author thinks, cause a parenchymatous keratitis, although it may be impossible to recognise the nodules from external appearances. Whether or not tuberculosis of the cornea

can exist as an independent disease, or is always secondary to a similar affection of the uveal tract, including, of course, the ligamentum pectinatum, is still, perhaps, an open question; but Bach holds that while, as a general rule, tubercle of the cornea is secondary to a similar affection of the ligamentum pectinatum, yet the marginal corneal zone may be primarily the seat of tubercular nodules which subsequently appear more towards the centre. The disease in the ligamentum pectinatum may exist either in the form of circumscribed nodules, or may be present as diffuse dirty greyish red granulation masses, which may also lead to deep-seated corneal opacities.

It is unnecessary to follow the author in his description of tubercle of the uveal tract and retina, but we may give the outline of a case which he adduces, where tubercle of the optic nerve was well marked. A boy, aged 15, had for some time been watched as the subject of typical choked disc in his right eye; the same condition showed itself in the left eye some time later, and was followed by atrophic discolouration of the disc. *Post-mortem* examination showed that the optic nerve in the orbit was encapsuled by tubercular granulation tissue, and although less marked, this was also present in its course at the base of the brain. The chiasma and the neighbouring parts were almost completely destroyed by tubercular disease. There was primary tubercle of the right temporal bone.

A brief reference to the fact that tubercular basilar meningitis may involve the oculo-motor nerves and thus bring about paralysis of the ocular muscles, and that tubercular osteitis of bones at the base of the skull may lead to the same result, brings the paper to a close.

N. M. ML.

GALTIER (Nimes). Subconjunctival Osteoma.
Annales d'Oculistique (English edition). March, 1895.

An example of this rare disease occurred in the author's practice some few years ago, and is now recorded by him for the first time. The literature of the subject is very

sparse, and indeed, in many text books on ocular pathology no mention is made of subconjunctival osteoma. The writer has discovered notes of only three cases—one, a case of von Graefe, another recorded by Saemisch, and a third which was observed in de Wecker's clinic in 1871. Of the three cases published it is unnecessary here to give full notes; they were all very similar in character, being firm resistant tumours, composed of an outer shell of exceedingly dense cellular tissue enclosing true bone in the centre. No cartilage was found in any of them. All were situated under the upper lid.

Galtier's own case, of which we give a more detailed account, resembled the others very closely in its characters.

The patient was a girl, 10 years old, apparently in perfect health, and was brought to consult the author because of a peculiarity in the right eye, of which, however, until her attention was drawn to it, she was quite unconscious. When she moved the eye downwards and inwards a well-defined projection, in form and size somewhat resembling a slightly flattened pea, became evident. It was lying under the bulbar conjunctiva, the corresponding raised portion of which was somewhat congested. The nodule was resistant, and only very slightly movable upon the eye, evidently adhering firmly to the conjunctiva which covered it. It was found to be impracticable to dissect it out from its surrounding tissues, and it was therefore removed *en masse* by means of scissors and toothed forceps. The substance of the tumour was formed of compact osseous tissue. The shape was rather like that of an oyster shell, the deep concave surface which was in contact with the globe being smooth and polished, while the superficial surface was convex, rough, irregularly nodular, and intimately adherent to the bulbar conjunctiva. Its length was 1 cm., its breadth 7 mm. The question that at once occurred to the author was whether this swelling was really a new growth, or whether it was a portion of normal bone accidentally detached from one of the orbital walls. The reply as to its nature, from the

laboratory to which it was sent for microscopic examination, was simply that the bony tumour appeared to be composed of normal osseous tissue.

The author's suggestion that the growth might be due to the presence of a fragment of detached bone rather than to an actual neoplasm, is supported by the history of a blow which the child sustained some six or seven months before she was brought to him. She fell violently on her forehead while running, and so sudden was the fall that she had not time to protect her face by holding her hands in front of her. She remembers that it was the right side of her face and forehead which struck the ground—in other words, the upper right orbital border must have been involved. The fall nearly stunned her, but by the next day she had thoroughly recovered. At that time there was nothing which pointed to injury of the eye.

The fact that since Galtier removed the growth six years have elapsed without any recurrence, taken in conjunction with the history of the blow on the orbit, certainly lends some colour to the author's contention as to its true nature. On the other hand, however, his case resembles very closely the three others recorded, and more especially that of Saemisch, with which, indeed, it is almost identical, and yet there is no history of traumatism in any one of the three. This, of course, may be due to an oversight on the part of the surgeons under whose care they were, but we are inclined to think that men like von Graefe and Saemisch are tolerably certain to have inquired fully into the history of cases—especially rare cases—which came under their observation. The odds are that if there had been a history of traumatism they would have said so. At all events we find it difficult, with the limited amount of evidence before us, to agree with the writer's suggestion that the cases recorded should be included under the head of fracture of the orbital vault with an encysted movable fragment of bone, rather than as examples of simple subconjunctival osteoma.

N. M. ML.

RICHARD HILBERT (Sensburg). Coloured Spots in the Field of Vision. *Zehender's Klinische Monatsblätter*, April, 1895.

There are many cases recorded in medical literature where colours are seen by patients, but as a rule the particular colour observed involves the whole field, and not only a part of it. The colour which is most commonly noticed is red ; yellow, green and blue have also been seen, but less frequently. It is a very rare occurrence to have the colour perceived only as a spot as in the following instance.

A woman, aged 36, in apparently very fair general health, came complaining of the condition of her right eye. For four months she had been troubled with watering and dazzling in this eye, and for a much shorter period with decrease of vision on the same side and with the presence of an annoying reddish-yellow spot which was constantly before her.

Projected on to a sheet of paper at 35 cm. distance this coloured area lay a little to the outside of the fixation spot, was 3 cm. high, 2 cm. broad, and showed a slight knuckling inwards of the nasal margin, so that it was somewhat kidney-shaped. The edges were sharp : acuity of vision within the coloured area was more affected than beyond it, but was not abolished. R.V. = $\frac{6}{24}$; L.V. = 1. Myopia of 3 D. in each. Pupils rather sluggish to light. There were flocculent vitreous opacities in the R., and numerous round separate areas of choroiditis, for the most part about half the size of the disc, and generally edged with pigment, were observed both in the periphery and about the centre in this eye. None of these areas corresponded in shape with the colour image described above. The author notes that the woman was not pregnant ; syphilis was excluded ; urine free from albumin and sugar. Owing to the photophobia it was impossible to measure the field with any accuracy.

The patient was kept in a dark room, and calomel and atropin administered. A fortnight later the red-yellow

spot had faded into grey. The vitreous opacities had greatly cleared up, and vision improved to $\frac{6}{12}$. After another three weeks the colour manifestation had disappeared, and the choroidal changes become very much less marked. The patient was not seen again.

The author refers briefly to the very few analogous cases which have been published, but does not describe them in detail. With regard to the nature of the lesion, he is inclined to think that in the cases where the whole field is coloured the lesion is probably central, and in those like his own, where only isolated spots are involved, probably peripheral, but he does not say why he thinks so.

N. M. ML.

LEPLAT (Liege). Death from Meningitis as a Result of Probing and afterwards Injecting the Lacrymal Canal. *Annales d'oculistique (French edition)*, November, 1894.

VALUDE (Paris). On the Consequences which may result from Infiltration into the Cellular Tissue of Liquids injected into the Lacrymal Canal. *Annales d'oculistique (English edition)*, March, 1895.

The history of Leplat's case, which he communicated to the Ophthalmological Society of Paris, is an interesting one and well worth recording. Without going into all the details which are set forth in the original, we give the main facts as follows:—

Madame M., who had previously been operated on for cataract of the left eye, first came to consult the author in May, 1890, because she was not satisfied with the result of the operation. Leplat detected a secondary cataract in the left eye, but as the sight of the right was still very good he advised her to wait before having the other needled. At this time there was no indication of lacrymal disease.

He saw nothing more of her till August, 1893, when she returned with a well-marked chronic dacryo-cystitis on the left side with copious discharge of pus from the puncta. The patient was very timid about operative interference and for some time refused to allow the use of any remedy stronger than ordinary astringents, but as she became convinced that no progress was being made finally submitted to having probes passed. It should be mentioned that all attempts at syringing through the duct had previously failed, not a drop of fluid escaping through the nose but returning entirely by way of the eye. On June 5 a No. 2 Bowman's probe was introduced carefully and without force into the duct, but it penetrated no farther than about two-thirds of the length of the canal.

On withdrawing the probe, no escape of blood having occurred, the writer injected first water and then a solution of alum into the duct, but the liquid did not reappear by the nose. On the next day Mme. M. was seen again; there was no swelling over the sac, but pressure here expressed pus freely, which was thicker and yellower than before. A probe was again introduced for the same distance as on the first occasion, left in for a quarter of an hour, and again there was no evidence of hæmorrhage. Alum solution was once more injected, and some at least made its way out from the nostril, some also getting into the throat. The author lays stress on the point that as he was manipulating the syringe the patient made a sudden movement and jerked the instrument violently out of its position. She complained a good deal of pain in the face and especially in the left upper gum, but knowing her fussy character, he not unnaturally discounted a good deal from her account of the severity of the pain.

The next time he saw his patient was on June 12, when he heard the report of the practitioner who had meanwhile been in attendance. So soon as she returned home after the last probing her daughter noticed a dusky spot which had appeared on the cheek downwards and outwards from the site of the lacrymal sac. The patient had complained of great weakness and of violent pains in

the head, chiefly on the left side. All this side of the face was much swollen, the swelling being limited to the left half, the eye was closed, the lids gummed together with pus, the mouth shut by reason of the tumefaction, pulse small, 120, temperature obviously raised, but the exact degree cannot be given as it was not recorded at the time. There was nausea, but no actual vomiting. The symptoms, in short, indicated an acute facial erysipelas and were treated as such.

During the next three days there was steady, if slow, improvement, but on June 10 vomiting began and the patient rapidly got worse. Unmistakable signs of meningitis developed, and she gradually sank, dying on the 13th, *i.e.*, seven days after the last probing and injection. The note of the facial condition on the day before the patient's death is shortly as follows. Pressure over the lacrymal tumour, which is painful to touch, causes a small quantity of pus to escape by the incised inferior canaliculus. The cheek, which is swelled from the lower orbital border to the upper lip, shows the dark area which appeared shortly after the injection, and is much indurated, but not painful to pressure. No trace of fluctuation. Lids normal ; the eye is not proptosed and moves fully in all directions. No swelling of the nasal mucous membrane, for the patient breathes freely by this nostril. The optic disc presents no abnormality.

Unfortunately no *post-mortem* could be made. The case, then, is one where the introduction of an astringent injection into the lacrymal canal after probing brought about an inflammation of the neighbouring tissues, and a meningitis, without any orbital lesion. There is no doubt that the injected fluid must have escaped from the canal into the surrounding cellular tissue by way of some perforation in the mucous membrane, which was caused either by the probe, or possibly by the syringe, when the patient made the sudden movement previously referred to. The author has difficulty in persuading himself that he made a false passage. He used very little force, and moreover, there was no apparent bleeding. The rupture of mucous mem-

brane may, he suggests, have very possibly occurred at the point of junction of the nasal duct and the lacrymal sac, where the lumen of the canal is comparatively narrow, and the astringent lotion have in this way penetrated into the sub-mucous tissue. He refers to two cases, one reported by Graefe, where an accident of this nature led to an orbital cellulitis, and finally to blindness; the other by de Wecker, where an abscess formed, but was luckily evacuated without injury to vision.

Gurwitsch has made a careful study of the anastomoses of the veins in this neighbourhood, and has found that in 9.5 per cent. of cases examined by him the vein of the lacrymal sac penetrated into the orbit and opened directly into the superior ophthalmic vein. If this arrangement of veins held good in Leplat's patient it is easy to see how infectious germs might be transmitted to the ophthalmic vein and thence to the cavernous sinus, assuming a rupture of mucous membrane about the site of the lacrymal sac. It is possible to argue that the infection may have been transmitted by way of the lymphatic channels, but their connection between the sac and meninges is less intimate than that of the veins.

Whatever the theory of the mode of infection may be there can surely be but one opinion as to the practical lesson to be drawn from a study of this case, and that is, not to inject astringents, or for that matter, even water immediately after having probed. Indeed, we would go a step farther and express our scepticism as to the utility of injections under any circumstances in the treatment of lacrymal disease. It may be that we have been unfortunate, but in any case, after an extended trial, we have abandoned their use as of no practical value.

The second case, that of Valude, to which we would draw attention, resembles Leplat's in several respects, although there was no injection into the lacrymal duct.

The patient was a man of 60 or thereabouts, who, on account of troublesome epiphora, had the canal incised and probed at a neighbouring clinic. The pain after the first probing had been very violent, and the history pointed to

probable tearing of the mucous membrane and possibly the formation of a false passage; much swelling and very pronounced ecchymosis had resulted. A probe was passed a second time after two days and again a third time, another two days' interval having elapsed, without causing much pain. No injection was made.

Valude saw the patient for the first time seven days after the original probing, and he then complained of failing sight on the same side (the right). Two days afterwards vision of this eye had sunk to perception of light only. The pupil did not react to light. Ophthalmoscopic examination revealed nothing remarkable; possibly the disc was a little redder than on the other side.

After another interval of two days it was noticed that the eye projected slightly forward, as in exophthalmos, and that the lids were a little swelled. Ocular movements were free and painless, but the eye and orbit were the seat of slight indefinite pains.

Ten days later the disc was found to be of a deep red colour, the veins tortuous and the arteries narrow. V. = 0. By degrees the papilla became completely atrophic and the proptosis disappeared.

The eye was previously emmetropic, and had had good sight. The patient, who was accustomed to shooting, knew that it had not been defective.

The hypothesis that tenonitis had caused the exophthalmos may be set aside, seeing that the movements of the eye were free and not painful. Valude concludes that a circumscribed orbital cellulitis had been set up by the forced catheterisation, and that this in its turn had led to atrophy of the nerve by the spreading of the inflammatory process. He thinks that the primary source of the orbital infection which was subsequently communicated to the nerve, was due to tearing of the mucous membrane and the probable formation of a false passage.

Valude is of opinion that there is increased liability to tearing of the mucous membrane when the incision of the lacrymal opening and probing are completed at one sitting. This may perhaps be so, although it is certainly doubtful,

but in any case so strongly is he impressed with the idea that he makes a rule of dividing the operation into two stages, slitting up the canaliculus and opening the sac first, and then two days later introducing his probes.

N. M. ML.

GEORGES MARTIN. *Astigmia versus Astigmatism.*
Annales d'Oculistique (English edition), March, 1895.

In a brief note the author proposes to substitute the word *Astigmia* for *Astigmatism*, as being, first, shorter and therefore more convenient, and secondly—a more important reason—etymologically correct. From the point of view of accurate derivation there is, we believe, no doubt that he has reason on his side. As at present used the word is derived from the Greek *α* privative and *στίγμα* *ατος* a brand or puncture, and sometimes loosely used to mean a point. The proper origin is undoubtedly *στίγμή* ἡς, a point in the mathematical sense, the idea being that when rays emanating from a luminous *point* penetrate an eye whose cornea or lens has a greater refraction in one direction than in the other they form an image not on a *point* of the retina but figures in the shape of lines or ovals. The word when derived from *στίγμή* of the first declension requires the termination *ia*, so that *astigmia* and not *astigmatism* is the proper term.

So much for correctness, but it would be a Herculean task to rectify all the errors that have crept into medical terminology, and unless there is any obvious advantage to be gained, we doubt if one more or less makes much difference. This view, we know, is open to serious criticism, as indicating a culpable disregard for scientific accuracy, but everyone knows what *astigmatism* means, and only few appreciate the difference between *στίγμα* and *στίγμή*. The introduction of a new word might easily lead to confusion; in short, is it worth while to make the change?

N. M. ML.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

THURSDAY, MAY 2, 1895.

D. AYGILL ROBERTSON, M.D., F.R.S.E., President, in
the Chair.

A New Operation for Ptosis.—Dr. Mules read a paper on this subject. The operation was first described by the author at the last International Congress of Ophthalmology at Edinburgh, in August, 1894. He now gave the results of his further experience of its effect. The principle of the operation was to substitute the frontalis muscle for the levator palpebræ by the following method :—Two needles with eyes near their points were passed deeply through the frontalis tendon over the eyebrow, and their points brought out at the margin of the lid behind the lashes, taking up a substantial part of the tarsal cartilage on their way. A piece of silver wire was threaded through each needle, which was then withdrawn, leaving the loop of wire passing from the brow to the edge of the lid and back to the brow again. This was then tightened until the lid was sufficiently raised, the edge of the lid being slightly grooved by an incision to allow the wire to sink into the substance of the lid. One end of the wire was then passed transversely under the skin and made to emerge by the side of the other end of the wire. The two ends were then twisted on each other until the lid was raised permanently; the ends were cut off, and the wire allowed to sink below the level of the skin. The skin at this point and at the lid margin healed over the wire, which remained permanently fixed in the substance of the lid. From further experience it was found that the wire remained in position without causing irritation; the lids could be closed, and remained closed during sleep. All kinds of wire had been tried, but it had been found that silver wire was the most satisfactory. It was necessary at the time of the operation to note the situation of the twisted end of the wire in case it became necessary to remove the suture afterwards.

The President was struck by the correctness of the principle of the operation, which was to establish a better connection between the frontalis muscle and the lid. He feared, however, that the wire might give rise to irritation if left in the lid for a very long time ; it was likely also to cut its way through the tarsal cartilage or the tissues of the brow, and thus lose part of its effect. A good operation for ptosis was much needed ; Snellen's operation was complicated ; Eversbusch's operation was good in slight cases, but not in serious ones ; Panas' operation was serious and disfiguring ; the thread operations were not sufficient or permanent.

Dr. Brailey thought it would be simpler to introduce the needles from below ; he was quite satisfied with the thread operation.

Mr. Donald Gunn asked whether both needles could not be passed through one opening over the brow, so as to avoid the angle in the course of the wire.

Mr. Spencer Watson, Mr. Lawford, Mr. Cartwright, and Mr. Ernest Clarke also took part in the discussion.

Blood Staining of the Cornea.—Mr. Treacher Collins read this paper. He found that this staining of the cornea, which was of a greenish or reddish brown colour, was due to the presence of a number of highly refracting granules scattered throughout its substance. These granules were not located with any definite relation to the spaces between the laminae of fibrous tissue ; they agreed in their spectroscopical appearances and chemical reactions with hæmatoidin. He found that in some of the cases associated with granules of hæmatoidin was a substance which gave an iron reaction with ammonium sulphide, and which was probably hæmosiderin. In eyes in which this discoloration occurred, the tension was generally increased, the exit of fluid through the angle of the anterior chamber being obstructed by the presence of blood clots. He was of opinion that hæmoglobin first diffused into the cornea from the anterior chamber through Descemet's membrane, and that the hæmatoidin, which is insoluble in the fluids of the cornea, was then precipitated there. The whole of the

cornea was at first affected, and when this was the case the condition could not be distinguished from that in which blood completely filled the anterior chamber. The absorption of the hæmatoidin granules began at the periphery equally in all directions, so that by degrees a narrow ring of clear cornea was formed surrounding the stained area. The appearances then presented were strikingly similar to those of a lens dislocated into the anterior chamber. The absorption of the granules becomes slower and slower the further they are removed from the sclero-corneal margin. He had seen one case in which the discoloration had completely disappeared in the course of about two years.

Mr. Jessop had had a case recently in which, as the result of an injury, the anterior chamber was half full of blood; there was also blood in the substance of the cornea, which disappeared after three days.

In reply, Mr. Collins thought that this case was quite different in character; it was a temporary transudation of blood or blood colouring matter into the corneal substance.

Sudden Severe Hæmorrhage from the Conjunctival Surface of the Lid.—Mr. W. H. Jessop read notes of this case. A woman, aged 27, was brought to St. Bartholomew's Hospital in a state of collapse due to repeated attacks of bleeding from the left eye. When seen, the pulse was 130, small, irregular, and difficult to count; the extremities were cold, and the right pupil dilated. On everting the lid, a small, jagged-edged ulcer, about $1\frac{1}{2}$ mm. in diameter, was found in the middle of the palpebral conjunctiva, from which bright arterial blood was flowing. The ulcer was burned by the actual cautery, and treated with cold compresses. With one slight exception it gave no further trouble. Fourteen years before the patient had had erysipelas of the eye and nose on the left side, since which time the lid had been slightly swollen. There was no history of severe hæmorrhage or of hæmophilia, and there had been no accident. The patient had been married twelve months, and had been pregnant seven months. The case was probably of nævoid origin, but it differed from the cases previously described inasmuch as there was no marked sign

of vascular tumour. There had been only three cases described, but none of them were quite like this.

Mr. Sydney Stephenson had lately had under his care a girl, aged 11, suffering from trachoma, for which the operation of "expression" had been performed. From that time spontaneous bleeding from the conjunctiva took place, and continued for more than five months. Although the patient had been repeatedly examined as soon as the hæmorrhage was observed, he had never been able to identify the point from which it came; the conjunctiva was uniformly red and turgid. The child was watched, but the hæmorrhage recurred again and again under conditions which seemed to place malingering out of the question. There were no signs of anæmia, purpura, or scurvy, and hæmophilia seemed to be excluded by the fact that the extraction of a premolar tooth was not followed by excessive bleeding; at the same time there was a history of swollen knee-joints occurring three times, and lasting some days.

Card Specimens.—The following were the card specimens :—Mr. Donaldson: Microscopic Specimens of Alveolar Sarcoma of the Cornea.—Mr. Marcus Gunn: Symmetrical Spontaneous Dislocation of both Lenses.—Mr. Morton: (1) Tumour of the right Malar Region, probably sebaceous; (2) Persistent Hyaloid Artery.

CORRESPONDENCE.

TO THE EDITORS OF THE "OPHTHALMIC REVIEW."

Medical College, Calcutta,
 May 7, 1895.

SIRS,—In Dr. Maddox's interesting "Optical Notes" in the March number of the Review, I see that in order to describe the inclination of the meridian of least ametropia in retinoscopy, he suggests using the features in the median line of the body, *e.g.*, speaking of chin slant, mouth slant, &c. I would venture to suggest another method as being about as simple and, perhaps, less open to objection in its phraseology; that is, to speak of the direction as is done on the rifle range in describing where the bullet has hit the target, as if the target were a watch face. Thus a hit downwards and outwards is a hit at 4, $4\frac{1}{2}$, or 5 o'clock, upwards 12 o'clock, downwards 6 o'clock, and so on. In target practice the distance from the centre is given at the same time, *e.g.*, a magpie at 8 o'clock, an outer at 3 o'clock, &c., are spoken of. This is unnecessary, of course, for Dr. Maddox's object, but the method might be applied in the description of other diseases. Dr. Maddox's chin slant would be a seven o'clock meridian, his mouth slant an eight o'clock meridian, and so on.

I am, Sirs, &c.,

F. P. MAYNARD, M.B.

(Surg. Capt. I.M.S.)

WHICH CANALICULUS TO SLIT IN PROBING THE NASAL DUCT.

BY J. B. STORY, M.B.

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THE article by Mr. Snell in the April number on the use of large probes in the treatment of lacrymal obstruction induces me to call attention to a point in reference to the treatment of these cases, which has not been sufficiently attended to in most of the publications on the subject. The obstruction to be overcome is situated in the nasal duct, and in order to pass the large sized probes, which are now and have been for many years, so extensively employed in this country and in America, it is necessary to divide one of the canaliculi. It might seem a matter of no importance whether the upper or the lower canaliculus is selected to suffer the necessary mutilation, but the choice is not a matter of indifference; the results are far better and more easily attained by selecting the upper instead of the lower.

Most text books take no note whatever of this, *e.g.*, Fuchs (translated by A. Duane from second edition, p. 514), simply recommends that the lower canaliculus be slit, without indicating that there is any choice in the matter. The same advice is given by Juler ("Ophth.

Science and Practice," second edition), who even adds a figure in the text to illustrate the method of performing the operation. Meyer follows Bowman's original method of dividing the lower canaliculus ("Practical Treatise," translated by Freeland Fergus from third edition, p. 594).

Swanzy ("Handbook," fifth edition, p. 240) also slits the lower canaliculum, although he incidentally remarks that Weber, not very long ago, advised the upper canaliculus as more suitable for the passage of large probes. Weber's reasons are given in Graefe's *Archives* for 1861, p. 106, thus: (1) The more easy introduction of probes, especially of elastic and wax bougies. (2) The diminished regurgitation of tears from the sac during the course of treatment, while the canaliculus remains widely divided. (3) The subsequent atresia which often follows treatment causes less trouble in the upper than the lower canaliculus.

It is somewhat remarkable that the merits of the upper canaliculus have been so neglected, for in the chapter on operations in Graefe Sæmische's "Handbuch," Arlt, after describing all the various methods of operating for lacrymal obstruction, states positively that the upper canaliculus is to be preferred for two reasons: (1) that probes can be passed more easily, with less twisting and twining, and (2) that subsequent loss of function in the canaliculus is less injurious when occurring in the upper than in the lower canaliculus.

In Wecker and Landolt's "Traité," too, the author of the article on diseases of the lacrymal apparatus (Prof. Merkel) selects the upper canaliculus wherever the slitting of one or other of these passages is necessary.

Among the modern English text books, Berry's is the only one I know which pays attention to this point. He selects the upper canaliculus for the same reasons which were given by Arlt and quoted above.

My own practice in this matter dates from many years back, and was adopted in consequence of my observing many patients who had been treated by division of the lower canaliculi, whose nasal ducts were perfectly patent, but who, nevertheless, still suffered from constant epiphora, and whose watery eyes were noticeable to the most casual observer. Since I have divided the upper canaliculus, I may have failed in some cases to obtain a permanent patency of the nasal duct, but I have never failed to relieve the epiphora in the cases in which I succeeded in curing the stricture of the duct. The advantages of the upper over the lower canaliculus have been so fully pointed out by Weber and Arlt that it is almost superfluous to re-enumerate them.

AN OPERATION FOR THE ADVANCEMENT OF A RECTUS MUSCLE.

BY FREELAND FERGUS, M.D.

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BELIEVING that the following method of advancing a rectus muscle is one of the easiest and most efficacious, I venture to send an account of it to the OPTHALMIC REVIEW. I have employed it for a number of years, and always with good results. It gives, I think, less puckering of the conjunctiva, and less inflammatory reaction than any other.

After the preliminary cleansing of the eye, a perfectly fresh solution of cocaine is applied to the conjunctiva and a few minims are injected beneath it, over the muscle to be advanced. The lids being separated with a speculum, with scissors and forceps two horizontal incisions are made in the conjunctiva, corresponding with the upper and lower edges of the muscle, and extending nearly from the cornea to the canthus. An ordinary strabismus hook is passed beneath the muscle, and is moved backwards and forwards so as to free it from all loose attachments to the underlying sclerotic. Two threads are employed, each provided with a fine curved conjunctival needle. One is passed from the upper incision through the centre of the flap containing the muscle and conjunctiva ; the other is passed in a similar way from the lower incision, through the same part of the muscle as the first. I put the greatest stress on passing the threads through the flap sufficiently near to the canthus. One thread is then tied in a firm reef knot, so as to include half the muscle and conjunctiva of the flap, and the other thread is similarly tied so as to include the other half. The muscle is next divided just in front of the knots, and as much of the flap as may be thought desirable is dissected off between the point at which the muscle is divided and the cornea. A small portion of the tendon-insertion is generally left.

This being accomplished, one needle is passed through the tendinous insertion, and is carried upwards beneath the conjunctiva, and brought out nearly above the vertical diameter of the cornea ; the other needle is passed in a similar manner and brought out nearly below the vertical diameter of the cornea. The ends of the upper thread are then crossed, drawn tight, and tied in a firm reef knot, and the lower thread is tied in the same way.

In order to relax the muscle which is being advanced,

and thus to avoid any tearing of the threads through the tissues, the patient should be caused to look well towards the external canthus when the internal rectus is being dealt with, and *vice versa*.

As a rule I use fine silk threads. These, if thoroughly aseptic, may remain in without causing the slightest irritation for several weeks, provided the ends have been cut short enough. A period of three or four days seems to be insufficient, hence catgut is unsuitable. All dressings are removed after twenty-four hours, and a light shade substituted.

In all cases of divergent strabismus I perform advancement, and in all cases in which I operate for any form of heterophoria. In convergent strabismus advancement seems to be required when the amount of the strabismus is fifteen degrees or more. As regards combining advancement with a tenotomy of the antagonist muscle, the latter operation may often be performed with benefit some few days after the advancement, although it sometimes obviously requires to be done at the same time.

My method differs from that described in Mr. Swanzy's admirable textbook, fourth edition, 1892, in that I include the conjunctiva in the ligatures as well as the muscle, and make two incisions instead of laying bare the muscle—in short, I make a flap operation, which avoids puckering.

THEODOR BEER. The Accommodation of the
 Eye in Fishes. *Pflueger's Arch. für Physiologie*, lviii.,
 Nos. 11 and 12.

Seldom has it been our privilege to read a work so full of interest, so clear in style, so industrious in research, and so fertile in results as this delightful monograph by Theodor Beer. It is true that the magnificent resources of the Zoological Station at Naples were at the author's disposal, but it is equally true that he has availed himself of his opportunities in a manner for which physiology will ever owe him a debt of gratitude.

We regret that we are compelled to give here only a very short abstract of the paper, scarcely more than the headings of the chapters. To do full justice to it we should have to translate it word for word.

The author begins with an account of what has been published on the subject before he approached it, the literature, as he puts it, being rich in hypotheses and poor in facts.

In 1852 Leydig found organic muscular fibres in the "campanula," an organ discovered in the eye of fishes by Albrecht von Haller.

In 1857 Manz approached the question of accommodation in the eye of fishes. In the living animal he could not find any proof that it existed, but he infers that it does. He concludes from the globular shape of the lens that a high degree of myopia is present, that such myopia probably undergoes correction, and that this can only be effected "either by diminishing the refractive power of the lens or by increasing its distance from the retina." Beer points out that it ought to read "diminishing its distance from the retina," not "increasing," which of course would increase the myopia. The mechanism of accommodation is attributed by Manz to the contraction of the campanula producing a shortening of the optical axis of the lens. This hypothesis was not supported by any experiments or observations altogether beyond reproach. As for the refraction

of the fish eye, Manz attributes to it a high degree of myopia.

Plateau, who examined excised eyes, comes to the following conclusions:—The eye of fishes has an almost plane cornea and a myopia of about 16 to 27D., scarcely greater in air than in water, enabling the animal to see practically as well in either medium.

Hirschberg was the first to examine the refraction of the living fish eye by faultless methods. In two pikes he found the refraction in water to be between 1.5 and 2.5D., in air somewhere near 25D. The effect of the cornea being eliminated in water he concludes that the fish eye would generally be slightly myopic, or very nearly emmetropic. He thinks it unlikely that any accommodation is effected by alteration of the shape of the lens, which he declares too firm to undergo any rapid change of shape, but he mentions the possibility of accommodation taking place by a change in its position.

The power of accommodation in the eye of the fish has hitherto been only inferred from teleological and anatomical considerations, without having ever been proved by actual observation.

Beer begins his investigations by examining the state of refraction of the living eye in water. This is by no means an easy undertaking. The fundus is usually poor in recognisable details, the focal length of the lens is very short, the eyes are often in constant motion, and the cornea is so delicate that, as far as possible, it has to be left untouched by any cover glass. Very often the animal had to be curarised and artificial respiration kept up for a long time by means of a jet of water introduced through an india-rubber tube inserted into the mouth of the fish. Usually the fish, wrapped first in a small napkin and then in a sheet of lead, was placed in a small glass tank, and examined both by the direct ophthalmoscopic method and by retinoscopy.

The rough result taken from about 100 fishes gave a slight degree of hypermetropia, and only in a few instances myopia.

This result, however, could not be considered as the true refraction, inasmuch as the distance of the examined ophthalmoscopic object from the layer of the retinal cones had to be taken into account. The final result, after due corrections in this respect, gave for the state of rest a myopia of medium degree—about 3 to 12D.

In some fishes, especially in *Scorpena*, it is possible to recognise the mosaic of the retinal cones in the living eye, even without the help of the ophthalmoscope. The true refraction, estimated directly by the ophthalmoscope, was found to be a myopia of between 4 and 10D.

From these observations Beer concludes that the state of rest for the eye of the fish is a myopia of medium degree.

For the sake of comparison the refraction of the living eye in air was also examined and showed a myopia of high degree, approximately 40 to 90D. These results are, however, not of fundamental importance, since the effect of the cornea is almost completely eliminated in water. It was also found that the cornea in air often showed high degrees of astigmatism and other irregularities such as facets, occasionally producing monocular diplopia. Beer feels, therefore, compelled to contradict the assertion of Plateau "que les poissons voient dans l'air aussi bien que dans l'eau." He quotes a description by Klinkowström of the *Anableps tetraphthalmus* of Surinam, which as it may interest ophthalmologists is given here.¹

Beer next approaches the question whether any alteration in the focussing of the dioptric apparatus in the fish can be observed. From the fact that the eye in most cases showed

¹ The cornea of this fish is divided by a horizontal pigmented band into two transparent semicircles; similarly the iris has two separate pupils. The animal swims only at the surface of the water, with part of the head and back above it, so that the horizontal pigment band of the cornea coincides exactly with the water line, the "lower eye" being below, the "upper eye" above water. On the lower half of the retina are thrown the rays coming from the objects in the air, while the upper half receives those coming from the water. The animal has, therefore, practically two eyes on each side, one for seeing in air and one for seeing in water. It is interesting to find an analogy to this condition in some insects, e.g., in the water-beetle, *Cyrrinus mergus*.

a moderate degree of myopia as the state of rest. Beer thought it *a priori* probable that if any accommodation took place it would be in the sense of removing the "near point" from the eye, *i.e.*, in making the eye less myopic. That a change of focus of some kind takes place in the eye of fishes was proved by its repeated observation during the examination of the living eye.

The methods of proving such accommodative change in the refraction was as follows:—The fish—preferably a scorpœna—was placed so that the eye examined lay in the aperture of the stage of a dissecting microscope, and electrodes were introduced into the subconjunctival tissue on opposite sides of the eyeball. The inverted real image of the fundus was then focussed for the dissecting microscope. As soon as a current was sent through the electrodes the image became indistinct, but could be seen again distinctly by moving the microscope in its tube. In order to exclude contractions of external muscles, the eye was enucleated and then examined in the same manner, the result being the same as before. These experiments were carried on first in air and then in water, every care being taken to avoid all sources of error.

In all these cases it was found that under the influence of electric stimulation the refraction *decreased* considerably, between 6 and 16D.

It was thus proved experimentally that accommodation exists, and that it consists in the focussing for distance. How then is this accommodation effected? By the last series of experiments not only the action of the external muscles of the eye was completely excluded, but equally so all possible influence arising from the state of the blood vessels in the ball. It remained to test the supposition of Manz and others, that a flattening of the lens produces the accommodative effect. Experiments with Sanson's images, carried out with all necessary precautions, failed however to reveal the slightest alteration of the curvature of the anterior surface of the lens. Beer, therefore, came to the conclusion that the hypothesis of the flattening of the lens by the pulling of the contracted campanula can no longer be maintained.

Beer repeatedly thought that in his experiments he could perceive a locomotion of the lens *in toto* during the electric excitation. The following simple test proved his observation to be correct :—In a freshly excised eye a long fine pin was thrust through the cornea into the lens—not very easily done where the lens is so very mobile ; during electric stimulation the projecting end of the needle made marked excursions while the eye itself remained quite steady.

It may be mentioned here that the cornea of the eye of fishes is by no means as flat as it is usually described in text-books ; furthermore, that the anterior chamber is rather deep—contrary to the usually accepted notion—especially in the circumlental portion, and that in the centre only is it almost *nil* owing to the fact that there the globular lens nearly touches the cornea ; the pupil forms more or less a transverse oval, showing both nasally and temporally the highly refracting line of the equator of the lens. Under these circumstances, which, however, are not equally favourable for examination in all kinds of fishes, it is not difficult to observe that under the influence of electric stimulation *the lens moves away from the cornea towards the retina, and at the same time also towards the temple.*

This observation has been verified by the examination of sixty-eight different species of fish, not selected with any particular purpose, but taken as they happened to be brought to the Zoological station. It is therefrom proved that in the overwhelming majority of the Teleostians *the eye has the power of a negative accommodation, i.e., of actively focussing for distance.* All these observations have to be made with care, or else it might happen that the movement of the pupillary margin of the iris might give the impression of a displacement of the lens. But as both the amount of stimulus, and the time of latent stimulation are different for the accommodative apparatus and for the iris, it is perfectly possible to separate both movements with such accuracy that no room for uncertainty is left.

Of the whole chapter devoted to the mechanism of the accommodation we can only give the results. The

anatomical relations of the campanula to the lens, and to the suspensory ligament of the lens are fully illustrated by various diagrams. The campanula can best be studied in the living eye of the two species *Scorpœna* and *Blennius*, against whose light-coloured fundus it stands out well; suffice it to mention here that the campanula goes towards the lens from the outer part of the retina. At a point of the lens equator opposite to the tendon of the campanula—for a fine tendon does exist—the lens is fastened by the suspensory ligament. This counteracts to a great extent any rotatory effect which the campanula might otherwise produce, and which it does produce in many cases after cutting through the suspensory ligament. This ligament, being very inelastic, also prevents the campanula from pulling the lens downwards.

For the campanula, which is by no means “bell” shaped, Beer proposes the name of “retractor lentis” from its physiological function.

Two interesting teleological remarks are added:—It might be expected that a muscle whose function it is to bring the lens nearer to the retina, would best come straight from the retina and go towards the posterior pole of the lens, somewhat after the position of the pecten in the eye of birds. But it has recently been shown that the pecten is an erectile organ, and has the function of shielding the retina from an excess of light. In most fishes such an arrangement would be wholly superfluous, as no dazzling light occurs in the depth of the sea; on the contrary, the actual arrangement of the muscle of accommodation is such that it practically does not obstruct any light whatever, but allows it the freest access to the retina.

Another interesting point is this, that the fish eye cannot become presbyopic, but retains its accommodative functions undisturbed by any possible hardening of the lens fibres and as long as the muscle of accommodation retains its function unimpaired.

Experiments were further made to elucidate the question whether the iris takes any part in the mechanism of accommodation. The contraction of the iris and of the retractor

lentic can be produced separately by graduating the intensity of the electric stimulus. It was thus found that in the majority of cases a displacement of the lens can be seen to take place without any appreciable contraction of the pupil. Equally the latency of the excitation differs in the same sense in the two cases. The movement of the iris appears later than that of the lens, reaches its maximum later, and after cessation of the stimulus returns later into the state of rest. It was further impossible in many cases to tetanise the retractor lentic, the lens returning into its old position after a few seconds while the iris remained tetanised.

On the other hand, the electric stimulus applied after severing the retractor while the iris is left intact produces only contraction of the pupil without any trace of displacement of the lens. In the majority of the Teleostians, therefore, all influence of the iris on the accommodation can be excluded.

The retraction of the lens, however, produces not only a change in the focussing of the eye, but also, by the locomotion of the lens, a displacement of the image on the retina. The theoretical deduction of the migration of the retinal image has been verified by Beer by actual observation. This can either be done by looking direct into the interior of the eye through the aphakic crescent on the nasal side of the pupil (an experiment which succeeds best in *Serranus*, *e.g.*, *scriba*, *cabrilla*, *gigas*, where the aphakic portion of the pupil is exceptionally large), or it can be observed on the outside of the retina from behind after dissecting off part of the sclerotic and choroid. For this purpose *Scorpena* is particularly suitable. It could be seen here, as anticipated theoretically, that the image—preferably that of a candle flame—shows in some parts of the visual field a displacement of over 1 mm., while if the rays of light pass in the direction of the lens retraction, the displacement is almost *nil*. The value of the displacement of the image it is not quite easy to make out, because nothing is known about any possible retinal areas of keenest vision, analogous to the fovea in the human eye. If there be no narrowly

circumscribed area of keenest perception in the retina of fishes, the accommodative retraction of the lens and the displacement of the image would possibly be a guide to the estimation of distance. This is made all the more probable because in the great majority of fishes the lateral position of the eyes admits of but very limited binocular vision. The complete decussation of the optic nerves also supports the view that in monocular vision, the estimation of depth may be procured by the migration of the image on the retina.

Experiments were also made to elucidate the influence of atropine on the accommodation. It was found that the accommodation is completely paralysed by the subcutaneous application of a 1 per cent. solution of sulphate of atropine. The alkaloid completely destroys the excitability to electric stimulation, not only of the nerves of the retractor, but also of the muscle itself, as was found on examining the excised eye.

When watching the living eye by the retinoscopic method, it can readily be seen that a few minutes after the administration of the atropine the refraction changes to a myopia of several dioptries higher than before. Beer utilised this effect of the atropine to examine the refraction in the state of rest, and found in two individuals of *Scorpæna* a *hypermetropia* of 8 and 10.D, proving that in fishes also anomalies of refraction occur.

It was not possible to produce spasm of accommodation in *Scorpæna* by subcutaneous injections of pilocarpine; eserine has evidently not been tried, or it would have been mentioned.

The range of accommodation was found to be between 4 and 10D., and it is probable, although the experiments were not carried very far in this direction, that parallel rays can be focussed easily on the retina in most cases.

The pupil shows a marked displacement towards the temple during the act of accommodation; the nasal portion of the pupil contracts, the temporal portion widens. In some cases this widening of the temporal portion is passive, being produced by the pushing action of the retracted lens, while in others it is an active one.

In the majority of instances atropine showed no effect on the pupil; only in the few species of Teleostians which have a very mobile pupil, *e.g.*, solea, a slight enlargement of the pupil was noticed occasionally. The day-myosis of sharks was not affected at all by atropine.

Atropinisation reduces considerably—often completely—the excitability of the iris to electric stimulation, while the reaction to light remains intact for a long time, even in the excised eye.

In none of the species of Plagiostome examined could movements of the lens be produced by electric stimulation. If they possess an accommodation at all it is probable that it is effected in a different way from that found in the Teleostians.

K. G.

WALTER EDMUNDS (London). Observations and Experiments on the Pathology of Graves' Disease. *Pathological Society*, May 21, 1895.

The enlarged thyroid of Graves' disease contains often, if not always, a tissue composed of secreting cells arranged in columns, and differing from normal thyroid in containing no vesicles and no colloid secretion. This tissue resembles that constituting the parathyroid glands, or accessory thyroids. These two glands are found in many mammals, and are probably present in all. They are most easily studied in rabbits, for in them they lie distinct, and at some distance from the thyroid proper. They are composed of columns of secreting cells, and contain no vesicles and no colloid. It has long been known that if the thyroid gland of a rabbit is excised the rabbit will not

(as does a dog or cat) die. Recently Gley has shown that if the parathyroid glands are excised as well as the thyroid, rabbits (like dogs) will die. The writer repeated Gley's experiments and found (1) that if the thyroid and parathyroid are both excised, the animals (as a rule) die; (2) if the thyroid only is excised some rabbits will live, and some die, and of those that die some have symptoms resembling chronic myxœdema in man; (3) if the parathyroids only are excised the animals do not die, and no very pronounced effects are produced. In dogs there are also parathyroids, which are partly embedded in the thyroid proper. Gley found that if they are dissected out and left (the thyroid proper only being removed) the dog will not die. The writer finds that if the whole of one thyroid lobe is excised, including its parathyroid, and the greater part of the other lobe, but leaving a small portion of thyroid proper and also the parathyroid, the dog will live, and the remaining portion of thyroid and the parathyroid will both hypertrophy.

Experiments were made with a view to testing the possibility of preventing the evil effects produced by thyroidectomy in animals by thyroid feeding or thyroid injecting. Out of twenty dogs thus treated after thyroidectomy only two were saved; but in the others life was prolonged by a few days, and the paroxysmal attacks of dyspnœa were prevented. Out of eight monkeys treated by subcutaneous injections of the extract after thyroidectomy, none were saved. The effects of cocaine injected subcutaneously into monkeys were also investigated. It was found that two grains of the hydrochlorate caused death from convulsions and failure of respiration. Quarter-grain doses caused drowsiness and inability to stand, and also enlargement of pupil, marked exophthalmos and widening of palpebral aperture; prior division of the sympathetic in the neck prevented (as Jessop had previously shown in the rabbit) to a great extent—if not entirely—the exophthalmos.

It is therefore suggested that in cases of Graves' disease, in which the exophthalmos is so great as to cause ulceration of the cornea, division of the sympathetic should be

tried, either alone or in conjunction with the usual treatment of stitching the lids together. This operation is not always successful; it has occasionally failed to prevent the sloughing of both corneæ.

Finally, the pathology of Graves' disease is discussed: one view is that the goitre is the primary affection, the other symptoms being due to the injurious effects of the internal secretion from the enlarged and altered thyroid. In favour of this view is (1) the very similar action of a chemical, namely, cocaine, and (2) the good effects often produced by the excision of a portion of the goitre in Graves' disease, a case of which is quoted. Against this view, and in favour of the disease being due to a lesion or functional disturbance of some part of the central nervous system causing irritation of the sympathetic, are the following facts:—(1) Graves' disease is not more common in goitrous districts than elsewhere. (2) It closely resembles the effects of emotion. (3) Emotion sometimes causes all the symptoms, which in this case are not permanent, but pass off again in a few days. (4) Emotion is a cause predisposing to the disease. (5) Graves' disease has some relation with diabetes (this presumably of nervous origin), for Graves' disease is sometimes preceded, accompanied, or followed by diabetes; a case of the last is cited. (6) Thyroid feeding does not cause exophthalmos in the healthy, nor does it, as a rule, make the subjects of Graves' disease worse.

E. HERTEL (Jena). The Relation of Acromegaly to Eye Disorders. *von Graefe's Archiv.*, vol. xli., part 1, p. 187.

W. B. RANSOM (Nottingham). Notes of Two Cases of Acromegaly. *Brit. Med. Jour.*, June 8, 1895, p. 1,259.

The first of the two articles named above presents, together with a complete bibliography of the subject up to last year, an analysis of the published cases with especial reference to the various conditions of the eyes which have been noted, and a detailed record of a fresh case with charts of the fields of vision. The second paper records two typical cases, and supplies the characteristic photograph and charts which are here produced.

The name acromegaly, meaning enlargement of the extremities, and the recognition of the condition to which it is applied, is of recent date. Although some isolated observations were published earlier, it was Pierre Marie in 1886 who first established and described the typical characters of the disorder. The question of its etiology and causation still remains open, for the disease is rare, and the opportunities of studying its pathological anatomy are rarer still. The chief structural changes consist in a remarkable increase in the volume of the bones and softer structures, especially in the extremities, accompanied by degeneration of muscles, nerves, and blood vessels. That these changes depend on tropho-neurotic influence appears probable from the fact that in the beginning of the disorder there are frequently disturbances of the vaso-motor and vascular systems, with abnormal pigmentation, growth of hair and excessive sweating.

The clinical symptoms are well known: enlargement of the hands and feet, prominence of the lower jaw, more or less enlargement of the nose, the lips, especially the lower, and of the tongue and ears, general debility, amenorrhœa in women, impotence in men, and usually more or less pain in the enlarged parts.

Among the organs of special sense the eye is the one most liable to complication. Among the records of 174 cases, Hertel found mention of eye disorder of one kind or another in 91, that is, in 53 per cent., but in some of these at least, there was no connection between the eye condition



FIG. 1.

From a typical case of acromegaly (by W. B. Ransom, *Brit. Med. Jour.*, June 8, 1895). Nose long and thickened; lower jaw large and prognathous; lower lip swollen and everted; skin of face coarse, thickened, and wrinkled; hands much enlarged, the fingers being uniformly increased without bulbous extremities and with flat square nails.

and the general disorder. He divides the eye conditions into four groups:—

Group 1 contains the cases in which the eye condition

appears to have been an accidental coincidence, *e.g.*, an error of refraction, conjunctivitis, keratitis, extreme arcus senilis, sclerectasia, opacities of the lens or vitreous, congenital anomalies such as choroidal atrophy, amblyopia, &c., and in one instance papillitis found on *post-mortem* examination to be associated with glioma of the brain. These several conditions, occurring in isolated cases, have little or no significance in relation to the fundamental disorder.

Group 2 includes certain cases in which the eye and its surroundings presented changes obviously due to the progressive enlargement of the bones and other tissues, *viz.*, thickening of the lids involving both tarsus and skin, abnormal pigmentation of the lids, warty growths, abnormal prominence of the orbital margins, emphasised by the increase of the eyebrows in length and thickness and by hypertrophy of the malar bone, so that the cavity of the orbit appears diminished and the eyeball partly buried by its enlarged surroundings. In other cases, on the other hand, there is more or less proptosis, the eye in extreme cases appearing to be pushed forwards almost out of the orbit by the increased volume of the orbital contents. In one case of unilateral acromegaly the eye of the affected side was itself increased in dimensions, as are in many cases the ears and the tongue.

In a third group the author places together the various disorders of the nerves of the eye, other than the optic nerve, which have been met with. Microscopic examination has shown in various peripheral nerves a condition of well-marked hyperplasia, the connective tissue being thickened and the nerve tissue degenerated. To similar changes probably are referable the pains in the face and in and around the orbit which are frequently complained of. Motor disturbances also are often met with, for example, nystagmus, limitation of the lateral movements, paresis of the third nerve, slight ptosis and limitation of convergence. Sluggishness or paralysis of the pupil with mydriasis have been noted several times. Some of these motor disturbances are doubtless referable to the neuritic process already mentioned, but from the fact that the

sixth nerve appears never to be affected, while the third nerve frequently is so, and that no pronounced paralysis occurs in other parts of the body, it seems highly probable that the immediate cause of the nerve disturbance in many cases is the direct pressure of the pituitary body to which the third nerve and its nucleus are particularly exposed, and this view is favoured by the fact that tumours of the pituitary body not associated with acromegaly have been found to affect chiefly the optic and third nerves.

The fourth group comprises the cases presenting changes in the optic nerve and is the most important, for it contains those which are characterised by the most important diagnostic symptom—atrophy through pressure on the optic commissure. The changes met with in the optic nerve do not seem to be of the same nature in all cases. In some instances a well marked neuritis has been seen with the ophthalmoscope, and in others also the resulting atrophy may probably have been of neuritic origin. Much more frequently, however, there is an atrophy due to pressure. As occasional causes of the pressure have been noted thickening of the bones at the base of the skull, deformity of the sella turcica, and narrowing of the optic foramina, but the usual cause is unquestionably an enlargement of the pituitary body. Hyperplasia of this organ has been found so frequently in cases of acromegaly as to suggest that it has some causative influence, but this idea appears untenable, for in many cases of the disease no trace of such enlargement has been found. In any case, however, its importance is considerable, for its effect upon the optic nerves constitutes a very characteristic symptom—bi-temporal hemianopia. In thirteen cases, to which Hertel adds a fourteenth, and Ransom two more, loss of the temporal halves of the visual fields with sharp limitation towards the middle line has been recorded, and in at least seven others the absence of an accurate statement as to the nature of the limitation of the field leaves it probable that it was of the same nature. Almost all *post-mortem* records of acromegaly with enlargement of the pituitary body describe a flattening of the optic nerves most pronounced at the chiasma, and the microscope has

shown degeneration most marked on the side in contact with the pupil. It has long been known that lesions of the chiasma produce bi-temporal hemianopia. It appears, therefore, that affections of the optic nerve in acromegaly,

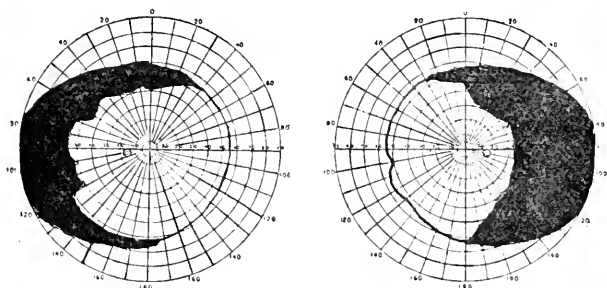


FIG. 2.

The visual fields of the patient shown in fig. 1. Bi-temporal hemianopia.

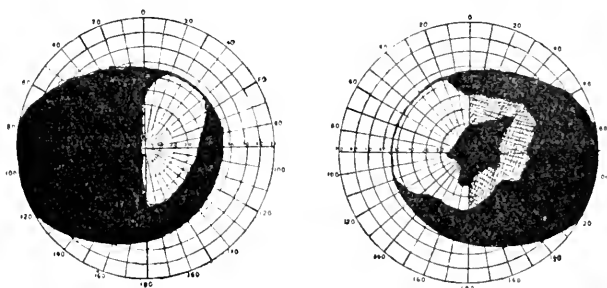


FIG. 3.

The visual fields from Dr. Ransom's second case of acromegaly. Bi-temporal hemianopia with some contraction of nasal field in each eye and a central scotoma in the right eye. Between the central and the temporal scotomata in the right eye is a zone in which light is dimly perceived.

although occasionally arising in other ways, are usually caused by pressure on the chiasma by an enlarged pituitary body.

With regard to treatment, the records before us give no encouragement. It is especially noted that neither arsenic nor pituitary extract proved beneficial.

P. S.

M. KNIES (Freiburg). Anterior Outflow Channels of the Eye and the Artificial Production of Glaucoma. *Archiv. of Ophth.*, vol. xxiv. 2, p. 169. Trans. by A. Duane.

The author of the above paper describes a number of interesting experiments upon dogs made with the object of rendering visible the channels of outflow from the eye (especially those of the anterior chamber) by means of the inflammatory changes produced by aseptic agents provocative of inflammation introduced into the vitreous chamber. In their passage through the outflow channels these bodies excited inflammatory changes, and the results of the present series of experiments agree with those of Knies' former researches with different substances (*e.g.*, ferro-cyanide of potassium) in showing that the outflow takes place mainly from the angle of the anterior chamber through the sclerotic to Tenon's capsule, and also to a less extent through the unaltered cornea into the subconjunctival tissue.

Besides the above, the main object of the experiments was to produce an artificial glaucoma by means of inflammatory processes of an adhesive nature in the anterior channels of outflow. In these Knies was only partially successful. Only temporary occlusion of the channels was produced, and therefore only temporary glaucomatous attacks. Continuous occlusion was not obtained. To obtain a fully developed glaucoma by this means the inflammatory agent must act continuously and less intensely than in Knies' present experiments. He suggests that it must act like the substance secreted by a growing malignant tumour, or like a crystalline lens displaced into the vitreous by couching.

Knies regards his results as finally subversive of the somewhat discredited neurotic theory of glaucoma, and insists upon the clinical and anatomical distinction between glaucoma simplex and the inflammatory forms of glaucoma. The former he regards as being what was first described by von Graefe as "*optic nerve atrophy with excavation*" the

latter as "*iridocyclitis anterior*." Glaucomatous iridocyclitis is to be distinguished from the ordinary iridocyclitis by the fact that in the latter the noxious agent has from the outset its seat in the iris and ciliary processes, while in the former it circulates in the vitreous and aqueous, and in its exit from the eye causes inflammatory changes in the region of the angle of the anterior chamber. In fact inflammatory glaucoma is an iridocyclitis in which the anterior channels of outflow are occluded temporarily at first, afterwards permanently, the permanent occlusion being due to adhesion of the periphery of the iris to the cornea.

The substances injected by Knies were oil of turpentine, olive oil or a mixture of varying amounts of the two substances, and also a combination of the latter with unguentum hydrargyri cinereum. The injections were made into the centre of the anterior portion of the vitreous.

J. B. S.

OSCAR DODD (Chicago). Diabetic Retinitis. *Archiv. of Ophth.*, xxiv., 2, p. 206.

This paper is based on an examination of all the published cases of pure diabetic retinitis which the author has been able to collect. Cases complicated with albuminuria are not included with the exception of two, one observed in the author's practice, and one in which a complete *post-mortem* examination is recorded. The number of cases analysed is forty-seven. To Eduard Jaeger we are indebted for our first knowledge of diabetic retinitis, and his observations were shortly afterwards corroborated by Desmarres and Noyes.

The views of modern ophthalmic surgeons on the subject are briefly as follows:—Noyes regards the features of glycosuric retinitis as almost identical with those of albuminuric retinitis, except that the bright yellow patches are not so likely to affect the macula, and they are more nodular and irregular in form. The disease is also much less frequent.

Berry states that it resembles albuminuric retinitis, but has fewer changes in the macula. Opacities in the vitreous are frequent.

De Wecker and Masselon describe it as very rare, and consisting of simple hæmorrhages alone, or mixed with foci of degeneration. Hæmorrhages also occur in the vitreous or in the coats of the optic nerve.

Juler regards it as almost indistinguishable from albuminuric retinitis. The arrangement of the white spots, however, is more irregular, and not so frequently radial round the macula. Hæmorrhages everywhere as dots, patches, and lines. Papillitis a late appearance. Vascular formation in vitreous and opacities end in detachment of retina. Disease is symmetrical.

Fuchs merely alludes to the disease, and attributes it to the altered condition of the blood.

Leber states that retinal hæmorrhages and whitish spots of degeneration with vitreous opacities are the usual phenomena, and the retinitis often cannot be distinguished from albuminuric retinitis.

Schweigger says that all forms of the disease are seen with diabetes, but none bear the same relation to it as albuminuric retinitis does to Bright's disease.

Hirschberg, however, groups diabetic retinitis into three classes: (1) Retinitis centralis punctata, which shows small bright spots and often hæmorrhages in the centre of fundus. (2) Retinitis hæmorrhagica, viz., hæmorrhage followed by inflammatory changes and degeneration. (3) Rare forms of retinitis and degeneration—*e.g.*, pigmentation, contracted fields and night blindness. Hirschberg considers eye changes more frequent in diabetes than is generally supposed.

Lagrange, following Badal, distinguishes diabetes from albuminuric retinitis by (1) the marked tendency to optic atrophy; (2) the rounder, less elongated shape of the hæmorrhages; (3) the more diffuse nature of the changes, not so restricted to papillary and macular regions; (4) the more temporary character of the apoplexies; (5) the disseminated spots without so much white fatty appearance; and (6) the early loss of colour sense.

Galezowski finds cataract more common in diabetes than retinitis.

The age at which diabetic retinitis occurs is generally an advanced one, usually after 45.

The most frequent type of retinal change found is the retinitis centralis punctata of Hirschberg. The spots vary in colour from a dull to a brilliant white or yellowish white, and are usually accompanied by minute hæmorrhages. The spots never run together. In another class of cases the changes are scattered all over the fundus; œdema of retina and nerve is rare, and vessels are usually of normal size.

Embolism of the central artery has been recorded twice, and thrombosis of a vein once. It is known that endocarditis is not infrequent in the later stages of diabetes.

Changes in the vitreous are not so frequent as might be supposed. They are only recorded in seven of the published cases.

Hæmorrhagic infarction of the retina, and hæmorrhagic glaucoma are both rare.

The subjective symptoms are often very slight, but the retinitis may be preceded by diabetic amblyopia without any changes in the fundus. The most frequent sequela is atrophy of the optic nerve. The pathology of diabetes itself is still somewhat uncertain, and the pathology of the ocular complications is in a similar condition. Ludwig Mauthner gives four means by which diabetes affects the eye: (1) Subtraction of water with presence of glucose, producing cataract, &c.; (2) Diminution of resistance of the tissues due to general malnutrition; (3) A toxic substance in the blood causing inflammation and degeneration; (4) Cachectic troubles.

Few examinations have been made as to the pathology of the intra-ocular changes. The principal changes observed have been in the smaller blood vessels, thickening of the walls, contraction of the lumen, leading to rupture, and producing the small hæmorrhages which seem to be so characteristic of the disease.

Dodd distinguishes diabetic from albuminuric retinitis by the following differences: (1) The spots in the retina are bright, glancing, irregular in outline, usually central, but frequently all over the fundus, while in retinitis albuminurica they often form a stellate patch, and are bright bluish-white; (2) If the spots are large there are also small ones, and they never run together; (3) Vessels not much changed, while in albuminuric retinitis arteries are small, veins large and irregular; (4) Optic nerve either not affected or atrophic, while in albuminuric retinitis it is swollen and its outline indistinct; (5) Retina not diffusely affected, while in albuminuric retinitis it is infiltrated.

As to the prognosis regarding the life of the patient, retinitis has been considered a grave symptom, but many of the patients have lived for years, and some have been cured of the diabetes. Treatment is purely dietetic.

J. B. S.

F. SCHANZ (Dresden). On the Improvement of Vision in High Degrees of Myopia following the Removal of the Lens. *von Graefe's Arch.*, xli., 1, p. 109.

Almost every operator who has performed the extraction of the lens in cases of high degrees of myopia must have noticed a considerable increase of vision after the operation, but the explanation of this increase has hitherto been anything but satisfactory. Fukala's first attempt to account for it by the increased size of the retinal image after

operation did not even satisfy the author himself for long, and he subsequently attributed it to the increased distance of the nodal point from the retina in the operated eye, without, however, adding much to our previous knowledge.

Schanz approaches the solution of the problem by comparing the optical systems of (a) the highly myopic eye corrected by a concave glass, and (b) the same eye after elimination of the lens. To facilitate the comparison still more, he considers the special case in which the myopia, caused by the elongation of the axis of the eye, is such that the posterior focus of the cornea falls on to the retina. This eye is corrected by a concave glass placed in the anterior focus. This special case has the advantage of giving the simplest conditions possible after the removal of the lens, viz., that of an aphakic emmetropic eye.

In comparing the effectiveness of these two eyes, not only the size of the image has to be considered, but also its distinctness. The distinctness (D) is directly proportional to the size of the image (g) and to the intensity of light (J), and inversely to the dispersion (z), or $D = \frac{g J}{z}$.

To compare the two eyes mentioned above it is therefore necessary to examine the size of the image, the intensity of light, and the dispersion in both cases.

As for the size, the calculation is greatly simplified by the circumstance that a lens, of whatever value, if placed in the anterior focus, does not affect the size of the image, but only its position. Hence it follows that the size of the image in the corrected myopic eye is the same as in the emmetropic "normal" eye. This image, compared with that of the aphakic emmetropic eye, is shown by a simple construction to be of the same ratio as the distances between the nodal point and the retina in both cases. In the two instances in question the anterior focal length of the emmetropic eye being 15.5025 millimeters, and the anterior focal length of the cornea 23.266 mm., this ratio is approximately as 2 : 3, or, in other words, the retinal image in the emmetropic aphakic eye is half as large again as in the emmetropic normal eye. Schanz

points out that Fukala is mistaken in attributing the same enlargement to aphakic eyes of normal dimensions when corrected by a lens of ten dioptries, since the size of the image does not increase with the cataract glass but decreases; *the weaker the glass, the larger the image*, until in the case of aphakic emmetropia the size $1\frac{1}{2}$ is reached.

Concerning the intensity of light, Schanz shows by a diagram the different effect of the same size of pupil in the case of a highly myopic eye corrected by a concave lens and in that of an aphakic emmetropic eye. In the latter case the amount of light admitted would be twice as great as shown by calculation; but as the image is larger and the light spread over a greater area, the intensity is practically the same in both cases.

With regard to the dispersion, the pupil again plays an important part. The author shows that in the case of the corrected myopic eye, where the entering rays are divergent, the dispersion is greater for the same sized pupil than in the case of the aphakic emmetropic eye, where the entering rays are parallel. Hence the distinctness of vision will be increased in the second case.

Furthermore, the dispersion is less in the aphakic emmetropic eye, inasmuch as the latter has only *one* breaking surface, as against *five* in the corrected myopic eye, and this is accentuated by the spherical and chromatic aberration of the strong concave glass employed.

From all these causes, the enlargement of the image, the increased intensity of light, and the greatly reduced dispersion a double, or even a threefold, increase in acuity of vision seems sufficiently accounted for.

K. G.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

THURSDAY, JUNE 13, 1895.

D. AYGILL ROBERTSON, M.D., F.R.S.E., President, in
the Chair.

Ophthalmia Nodosa.—This paper was read by Mr. Lawford. The disease was one to which the name ophthalmia nodosa was applied by Sæmisch, and which results from the penetration of the tissues of the eye by the hairs of certain caterpillars. Mr. Lawford's case occurred in a lad, into whose right eye the foxmoth caterpillar (*Bombyx rubi*) had been thrown; this was followed by severe and protracted inflammation, which lasted with intermissions and remissions for six months, and ultimately subsided, leaving the eye little, if any, the worse. Two hairs were removed from the lower part of the conjunctiva, but none were discovered in the deeper tissues. The previously recorded instances of this disease, some eight or nine in number, have all occurred in Germany, and in those cases in which it was possible to determine the kind of caterpillar, the larva of the pinemoth (*Bombyx pini*) or of the foxmoth (*Bombyx rubi*) was the one which had caused the ocular lesions. In most cases the caterpillar had been thrown at the patient by a playmate or companion. The clinical features of the disease are inflammation of conjunctiva, infiltration of the cornea, and generally severe iritis or iridocyclitis, with opacities in the vitreous. The development of small firm grey nodules in the conjunctiva, episcleral tissue, or iris has been noted in every case, and examination of these nodules microscopically reveals a structure very closely resembling tubercle, with numerous giant cells, and in the centre a section of a hair. In several cases sight has been seriously and permanently damaged, generally by blocking of the pupil, but in no instance has total blindness resulted. The disease has always occurred in country folk and usually in children. One case is reported to have commenced in June, all the

others in August, September, or October. Mr. Lawford described the varieties of caterpillar which are known to have given rise to this disease, and discussed the methods by which the lesions might be produced, expressing the opinion that the affection is probably toxic in origin, the poison being contained in the hairs, which in some caterpillars are connected at their bases with glands.

Mr. Hartridge suggested that the prolonged irritation might more probably be due to the migration of the buried caterpillar hairs than to the introduction of a poison at the time of the initial lesion.

Mr. Donald Gunn referred to a report, for the truth of which he could not personally vouch, that our troops in India are liable to inflammation of the eyes supposed to be due to the smooth-skinned green caterpillar crawling over the surface of the eyeballs while the men are asleep.

In reply, Mr. Lawford said that migration of the caterpillar hairs was supposed to take place only for a short time; the hairs then became encapsuled, and remained stationary until disintegrated. Moreover, the inflammatory symptoms were referable chiefly to the iris and ciliary body, even though there was usually no evidence to show that these structures had been penetrated by the hairs. As to the disease referred to among the troops in India, it must be of a nature quite different from ophthalmia nodosa, as the latter only occurred after forcible penetration of the hairs.

Nine Cases of Chancre of the Eyelids and Conjunctiva.—Notes of these cases were read by Mr. Snell. The situations of the chancres were as follows: two at the internal canthus, one at the external canthus, three on the upper eyelid, one on the lower eyelid, one on the ocular and one on the palpebral conjunctiva. Three of the patients were as young as $2\frac{1}{2}$, 4, and 11, and the others were aged 20, 21, 28, 29, 30, and 55. The number of chancres on the eyelids or conjunctiva recorded in the *Transactions* of the Society were so few that it appeared as if his experience was altogether exceptional. He thought, however, it was

possible that the true nature had not, perhaps, always been suspected. Bulkley gave the proportion to all extragenital chancres as 4 per cent. Generally the diagnosis was not difficult. In all his cases induration of the pre-auricular gland was present, and in some cases of the sub-maxillary glands also. The induration of these glands should suggest the specific character of the lesion. There was difficulty, as was usual in such cases, in ascertaining the exact mode of infection. One was assumed to have been occasioned by a scratch from a syphilitic infant the girl was nursing; in another, the mother and her baby were syphilitic, whilst in a third both father and mother were so affected. Two were playmates, one of them coming under treatment shortly after the other; another was an inmate of a lodging house where four towels sufficed for eighty people.

Mr. Marshall had watched a case at Moorfields somewhat resembling Mr. Snell's. The patient was a man, aged 20, who had an ulcer which did not yield to treatment till anti-syphilitic remedies were used.

Mr. Hill Griffith thought the chief interest of this class of case lay in the diagnosis; until the secondary eruption appeared it was difficult to make a positive diagnosis. The two things with which it was likely to be confounded were: (1) A vaccine pustule, which occurs accidentally more often than is supposed; and (2) a tuberculous ulcer. He thought that the local inflammation resulting from vaccine pustule was usually more intense than that following chancre of the lid.

Dr. Bronner had seen eight or ten of these cases. He suspected that they were not so rare as was generally thought; the subjective symptoms are often slight, and patients do not come to the hospital for advice till it is too late to recognise the true nature of the sore.

Card specimens.—The following were the card specimens: Mr. H. Secker Walker: (1) Sarcoma of the Iris; (2) Epithelioma of the Cornea and Conjunctiva; (3) Coloboma of the Iris and Choroid.—Mr. Devereux Marshall: Cystic Sarcoma of the Ciliary Body.—Mr. Morton: Microscopical

Sections of Tumour of the Face.—Mr. J. B. Lawford: Peculiar Coloured Deposits in Crystalline Lenses.—Mr. H. Work Dodd: Congenital Pigmentation of Retina.—Mr. Silcock: (1) Congenital Anterior Synechia; (2) Tuberculosis of Eyeball Recovering.—Mr. Nettleship: Case of Retinitis Proliferans.—Mr. Doyne: (1) Case of Acromegaly; (2) Degeneration of Retinal Arteries.—Dr. Beevor: Case of Ophthalmoplegia Externa.

THE BOWMAN LECTURE ON SUBJECTIVE VISUAL SENSATIONS.

Delivered before the Ophthalmological Society on June 14, 1895.

By W. R. GOWERS, M.D.LOND., F.R.S.

CONSULTING PHYSICIAN TO UNIVERSITY COLLEGE HOSPITAL; PHYSICIAN TO THE NATIONAL HOSPITAL FOR THE PARALYSED AND EPILEPTIC.

Dr. Risien Russell read the Bowman Lecture for Dr. Gowers, who was unavoidably prevented from being present. We quote the paper almost in full, omitting, however, a few introductory remarks which prefaced the subject proper. Dr. Gowers said:—

In selecting the visual sensations that occur without external cause as the subject for this lecture, I hoped to be able to reduce to some order the numerous facts recorded in my case books in connection with epilepsy and migraine, and to do so with the help of that which has been discerned and described by others. But I have found among the facts some which seem to be so instructive in a special relation that I have felt compelled chiefly to limit myself to a small part of the subject. Even within this narrow

range, instead of explaining, I find myself able merely to point out that which needs explanation, and this only in its salient outline, in the hope that others may be able to see more clearly from the standpoint to which they may attain, as steps are cut in the steep hill-side of fact. Thence a wider prospect and a true perspective may be obtained, as the winding path of daily work is ever bringing before the eye new views of that which has long been known and perhaps misknown. The facts with which I have to deal are those of every-day experience, and yet are only now and then presented to us in needful definiteness of form and precision of discernment. I can only hope to-night to indicate how the facts should be regarded. Unless some idea exists of what to look for, we shall see but little.

The difficulty of ascertaining the facts depends on their subjectivity. That which is to be discerned can be seen only through the vision of another. Moreover, this is the vision of the unreal; it is the sight of that which is not. Unreal as it is, to the subject it is, as a sensation, a profound reality that confuses the mind and may make even recollection painful. Hence the opportunities for ascertaining trustworthy facts are very rare, and when they come it is important that they should be made the most of. If that which I have to say to-night induces many others to seize some of the opportunities that abound, and to make known the facts they learn, I shall count my effort thoroughly successful.

As I have said, the visual sensations met with in the two diseases, epilepsy and migraine, are far too varied to be considered in detail in all their numerous forms. But they present one relation which transcends all others in interest, in difficulty, and in importance. This is the apparent relation of the sensations to the functions of the cerebral centres in which we must assume that they arise, and through which we must also assume conscious vision of external objects is achieved. In 1885 I put forward the opinion, which has been confirmed by all that I have since been able to perceive, that, in addition to the half-vision centre in the occipital lobe, demonstrated by Munk, the

indications obtained by Ferrier are correct, and that there exists a higher visual centre in the region of the angular convolution, which immediately subserves the perception of visual impressions. As I then suggested, impressions seem to pass to this higher centre in each hemisphere from both half vision centres in the occipital lobes, in such a way that in each higher centre both fields of vision are represented, but that of the opposite eye in greater degree; that the connection between the two higher centres is very intimate; and that the function of the higher centre differs from the lower in two ways. First, it seems to present the mysterious feature that, while partial disease of the lower centre causes partial loss of the related half-field, which cannot be compensated, partial disease of the higher centre seems to lower the function of the whole in a way we cannot at present understand. Secondly, and perhaps associated with this, there is some capacity for the compensation of loss by the other hemisphere, especially in the lower animals. This may be one reason why the pathological evidence of this centre in man is so scanty, and another cause may be found in the fact that the centre is in the region of the blood supply of two different arteries, and so is seldom entirely destroyed. The facts that suggest—indeed I think indicate—the existence of this centre in man I have repeatedly stated during the last ten years. In the strange hemianæsthesia of hysteria we have evidence of arrested action of all the other higher special sense centres in one hemisphere. We never meet in this association with the hemianopia that results from disease of the lower centre in the posterior extremity of the hemisphere. Instead we have the “crossed amblyopia,” as it is termed; peripheral vision is lost in both eyes, central vision persists in a small area in the opposite eye, and in a larger area in the eye of the same side. No trace is found of any relation to the half-fields. But hysteria is a bye-word, and all facts, however definite, with which the name can be connected are disregarded by physiologists. Yet the same affection of vision occurs in organic disease. I have given an illus-

tration of it,¹ as a lasting symptom in a case in which it was caused, with hemiplegia, by a sudden lesion, probably hæmorrhage, in one hemisphere. A similar loss has been met with when the angular region was found diseased.² When hemianopia is caused by disease of the cerebral hemisphere it is common for a like contraction of the remaining half-fields to reproduce the same change, greater on the opposite side.³ A careful scrutiny of pathological evidence makes it probable that in these cases the disease is in the white substance, interrupting the half vision path and extending forward to the fibres beneath the higher centre or to its grey matter. These may seem meagre grounds for the assertion that here we have a higher visual centre, but they agree in a remarkable way with the experimental results obtained by Ferrier, and a large number of the facts of disease cannot otherwise be understood. A theory that explains is not necessarily true. But if a theory that affords an explanation which can be obtained in no other way, which theory has other, varied and quite independent evidence, it seems to me that we are justified in its assumption. I have to ask you to postulate these higher visual centres, for I can only describe the facts or at least suggest their significance by placing them in front of this hypothesis. I am compelled also to justify my request because these centres seem quite outside the limits of our present scientific physiology.

Note the necessary significance of "crossed amblyopia." With loss of the higher visual centre of the left hemisphere we have in the right eye vision only in a small central region; in the left eye sight remains in a larger central region. In each eye there is a peripheral loss. The significance of this is that the vision that remains is subserved by the right higher centre acting alone. This subserves a large central region on the opposite side, a small

¹ "Manual of Diseases of the Nervous System," vol. ii., second edition, fig. 83 (first edition, fig. 81).

² *Ibid.*, fig. 15 (first edition, fig. 14).

³ *Ibid.*, fig. 82 (first edition, fig. 80).

central region on the same side, but, without the co-operation of the opposite centre, it cannot subserve peripheral vision in either eye. The facts are certain, and their meaning seems to me alike startling and unquestionable. It seems that in the central regions of the fields vision can be subserved by either hemisphere alone, in the peripheral parts by neither alone. It is as if the impulse from the periphery of each retina ultimately reached the higher centre of one side through the opposite visual centre, as if those from the peripheral region of each half-vision centre in the occipital lobe passed to the opposite hemisphere through the higher centre of the same side, and those for the central region passed directly from the half-vision centre to each higher centre. So, that, for instance, the peripheral impressions of the right higher centre have to pass through the higher centre in the left eye, and the loss of this involves peripheral blindness on both sides. Whether this is so, or whether some reflected co-operation is essential, the facts show how extremely close is the functional relation of the two. In this higher visual centre we must assume the processes to occur on which the subjective visual sensations depend. From this conclusion I think there is no escape, and this may become apparent as we consider their features on this assumption. The more elaborate function of this centre may be connected with the instability which underlies these symptoms. They reveal not only how extremely close must be the connection between the visual centres of the two hemispheres, but that, as regards some part of their functions, they must be regarded almost as one centre, as united in a manner more essential than that in which any other centres of the two hemispheres are conjoined. This is, indeed, not surprising when we consider how unique is the function of sight as subserved first by the two eyes, and secondly by the lower visual centres in which the half-fields are represented in so limited a manner. Only from the region of the fovea centralis do fibres pass to each occipital lobe. Only in a small region around the fixing point, varying in size in different persons, but always too small to be revealed by the ordinary perimeter, is vision

subversed by each lower centre. But the whole of each field is in some way related to each higher centre. The subjective visual sensations present the function of these higher centres from another point of view, from that of their activity, and not of their loss. The ground is one on which we have to tread with caution, in which the danger of fallacious inference is great, and yet that which is seen must contain in it evidence of facts which can be discerned in no other way.

THE VISUAL SPECTRA OF EPILEPSY.

The "warning" which occurs at the moment of the onset of an epileptic fit—the first effect on consciousness of the process of "discharge"—is often a visual sensation. This may be, or may not be, the first event. It may be preceded by some other sensory perception or it may be followed by some other, but it shows that the process of discharge occurs first or early in the visual centres. Such sensations are extremely varied, but they are, as a rule, constant in the same patient, and when they occur consciousness is adequate to permit the memory to retain them. The simplest of these visual warnings are sudden flashes of light or colour, sparks or stars, often in rapid movement among themselves, apparently like the movement of water-beetles on a pond. Sometimes a large luminous object appears, which may move across the field, or seem to approach or to recede. There may be two such objects, rarely three, and they may be white or coloured. More elaborate sensations are figures of persons, faces, often distorted into grimaces; a figure may also move. Occasionally there is a vision of places or of some scene, even such as is quite beyond the possibility of past experience. Such elaborate sensations—"psycho-visual" as they may be termed—are often associated with definite mental states, which may be very curious. The warning in one patient was a definite picture of London in ruins and the river Thames emptied to receive the rubbish; that all the inhabitants had perished, and the patient stood

alone in the scene of desolation. The associations of these visual sensations are noteworthy, but I must only mention the fact that the frequent associations are with other special sensations, especially with the sense of hearing, seldom with smell. The associated sensation is generally of the same degree of elaboration. A patient who sees figures will seem to hear words uttered by them, although the words are generally forgotten—an association which reminds us of the celebrated vision on which the fame of Lourdes arose. One curiously complex visual warning, experienced by the same patient through many years before every fit, I have described elsewhere, but it deserves mention. A sense of beating of the heart ascended the chest to the head and became audible as a pulsating sound; then two lights appeared before the eyes, which seemed to approach with jerks; they suddenly disappeared and were replaced by the figure of an old woman in a red cloak, who offered the patient something which had the smell of Tonquin beans, and then he always lost consciousness. The case is remarkable on account of the change of the sensation of simple pulsation to that of sound, and the association of the latter with a pulsating visual spectrum, the replacement of these by a highly complex spectrum, and the final termination with an olfactory sensation, probably elaborate. There is reason to think that the more pleasant subjective sensations of smell are more elaborate than the common disagreeable sensations. The jerky movement, definitely synchronous with the pulse, is not uncommon in such simple visual sensations, and seems to indicate that the process, in the disturbed centre of the brain, is modified by the mechanical influence of the arterial pulsations. I may point out also the interesting fact that the more elaborate sensation, the vision of the woman, followed the more simple one, the two lights. This sequence is more common than the opposite, although now and then an elaborate sensation is followed by one that is more simple. The sudden spontaneous activity, which we call “discharge” of the centre, may occur as a primary event, but it is often preceded by

sudden arrest of function, by inhibition of the centre. It is one of many instances of the fact that the same functional derangement, in different degree, may cause cessation of action or increased action. In one case, suddenly all became dark, then there appeared a red light before the eyes, changing presently to green, and then consciousness was lost and the convulsion came on. In another, sight became dim and misty, then two round green lights appeared, compared to a penny at a distance of two feet, which moved from side to side. It is very common for the first darkness to be the background for bright stars. Much less frequently stars or flashes of light are followed by loss of sight and darkness—that is, discharge is followed by inhibition.

COLOURS.

The colours seen in these epileptic sensations are generally either green, red, blue, or yellow; a reddish yellow is especially frequent, and seems to be very much the colour commonly assumed to be that of flame. Now and then emphasis is laid on the bright golden character of the yellow. The transition of red to green just mentioned I have met with in two or three other cases. It is interesting, on account of the complementary character of the two colours, and the fact that the transition is central; but we are not yet in a position to discern anything regarding the nature of the colour process in the centres. The subject is of extreme interest in connection with the problems of colour vision, to the physical relations of which so much attention has been lately given. I believe that ultimately the study of the central phenomena will throw light upon the subject, possibly of supreme importance, but the time is not yet come. The perception of colour in the visual sensations which precede epilepsy presents to us one feature which must detain us for a short time, because it is equally obtrusive in the visual sensations of migraine which I shall have presently to describe. It is the fact that the subjective colour sensations seem to extend to the extreme periphery of the field. They are as distinct and frequent

in the peripheral region as in the central region. I could give you many illustrations, but one will suffice. Green is the colour which is said to have the smallest colour field, its perception being often described as confined to the central region. But to one patient, before each fit, there appeared the vision of a green colour over the whole lower half of the combined fields, extending from side to side and down to the lowest part, as was clearly shown by his spontaneous description that "it was just as if he were standing in a field of grass."

PERIPHERAL COLOUR VISION.

Different as the arrangement of function in the centres is from that in the eyes, there must be a perfect reproduction of the function of the retinal fields in the higher centres. Although it is in altered form, whatever vision the periphery of the retina subserves, the parts of the visual centres related to the periphery must subserve the same vision in the same way, similar in character and in degree. The fact that the subjective sensations may present every colour in the peripheral field—even green, to which the retina seems least sensitive—brings before us the question of peripheral colour vision. The facts I am about to state have been well known for nearly twenty years, since Chodin¹ worked at peripheral colour vision in regard to saturation. They were described by Landolt, but they are not very familiar, and they are curiously inconsistent with the statements commonly made. It is often said that the field in which red can be seen is the central region, the limit of which crosses the outer horizontal radius at 45° . This limit is even spoken of as "the boundary of the field for red." But it is only the area in which red can be perceived on an object one centimetre square. The same statement in regard to a still smaller region is made regard-

¹ *Archiv. für Ophthalmologie*, Band xxiii. See also Landolt: "A Manual of the Examination of the Eyes"; and Swanzy: "Diseases of the Eye," p. 19.

ing green. But with larger area of colour it is found that all the colour fields differ in extent very little from the fields for white. On the temporal side in each field red can be seen up to 90° . Taking first the red field, it is found that it depends in size simply on the size of the coloured object. In the outer horizontal radius that for the half-centimetre square is, I find, at 35° , and for a quarter-centimetre square at 25° . If we pass beyond the one centimetre limit, which is commonly figured as that of the field for red, we find that a red area two centimetres square is seen at 60° , three at 70° , four at 78° , five at about 82° , while the area of six centimetres square is seen up to the extreme edge of the field. Upwards, downwards, and on the nasal side of the field, in which the range of vision is so much more limited, the areal limits are closer together, so that on the inner horizontal radius the three-centimetre limit is at 40° and the six-centimetre area of red can be seen at 50° —that is, at the edge of the field for white. Every field is thus practically concentric with the field for white. In the case of blue and yellow still smaller areas suffice to permit the colour to be seen up to the edge of the field for white. Green alone seems to fall short of the edge of the white field by about 5° . I have spoken of areas of two or more centimetres square. But this is not accurate. At each distance from the centre at which the colour can be seen in an area of a certain dimension, the same in the radial direction and in the concentric direction, it can be seen equally well if the radial dimension is only two-thirds of the concentric dimension. As far as I have been able to ascertain, the peripheral colour vision is determined by area rather than by illumination, but I have found it difficult to get a sufficient saturation to bear strong illumination.

I have spoken of the mysterious way in which peripheral vision seems in the higher centres to be dependent on mutual co-operation, that in neither eye can peripheral vision occur unless the centres of both hemispheres are active, while in the central region there is vision in both eyes, although only the higher centre in one hemisphere is active.

This peculiar mutual influence of the centres is exemplified further by the colour fields. The field for every area is larger if both eyes are open. This seems natural so far as concerns the part of the two fields which overlap. But it is true also of the temporal part of each field in which the field is single. Binocular intensification extends into this part and extends into it in the same degree as in the part where the fields are double—for instance, in the outer (temporal) horizontal radius of the right field. In the single field red is seen in one centimetre square at 42° , in the double field at 60° , although the left field only extends as far as 56° . In a square of two centimetres red is seen in the single field at 62° , in the double field at 72° , and in a square of four centimetres in the single at 80° , while in the double field it can be perceived almost up to the edge at 90° . The fact that in the part of the field in which each is single there is increased sensitiveness when both eyes act gives additional emphasis to the strange fact that, in this region, loss of one higher visual centre causes peripheral blindness. It shows how complete is the blending of function in the two centres. In this outer periphery vision is impossible unless both higher centres act, but where the rays of light fall on one retina only their effect is greater if the other eye is open—that is, if both centres are fully stimulated.

(To be continued.)

A CASE OF BINASAL HEMIANOPIA.

BY HENRY EALES.

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THE following case presents features which are interesting and somewhat unusual, and seems to me therefore to be worth recording. The facts are shortly as follows :—

C. H., aged 75 years, first came under my notice as an out-patient at the Eye Hospital, Birmingham, on April 4, 1894. He stated that his sight began to fail about eighteen months previously; the failure immediately succeeded a prolonged period of ill-health caused by a whitlow in the right thumb, which was followed by enlarged and painful glands in the axilla, and ultimately by the loss of the distal phalanx of the thumb. During this illness his urine became thick, and micturition frequent, and this condition has remained present more or less ever since.

Patient's hearing has been failing for about two years, but has been worse since his illness, and especially during the last eight months. There was no history of syphilis, and no history of headaches or vomiting.

R.V. = $\frac{6}{6}$; L.V. $\frac{6}{1\frac{1}{2}}$ with + 1D. The shadow test showed hypermetropia of 1D. in each eye.

With the ophthalmoscope both optic discs were filled in and presented a greyish yellow appearance, with loss of definition of their margins, as if an interstitial neuritis of a chronic, and not very severe type had been going on for some time; there were signs of deep exudation, but

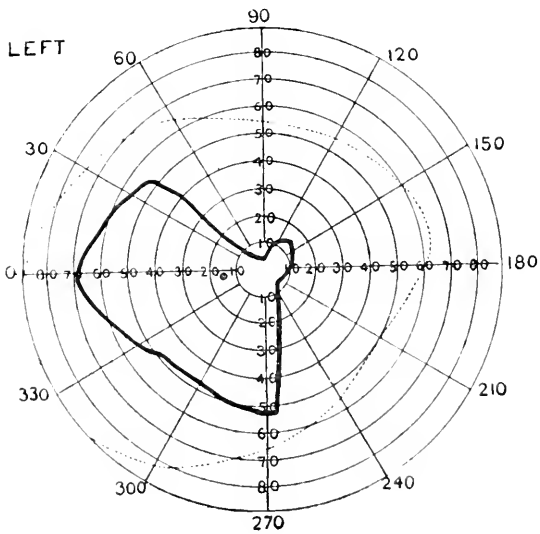
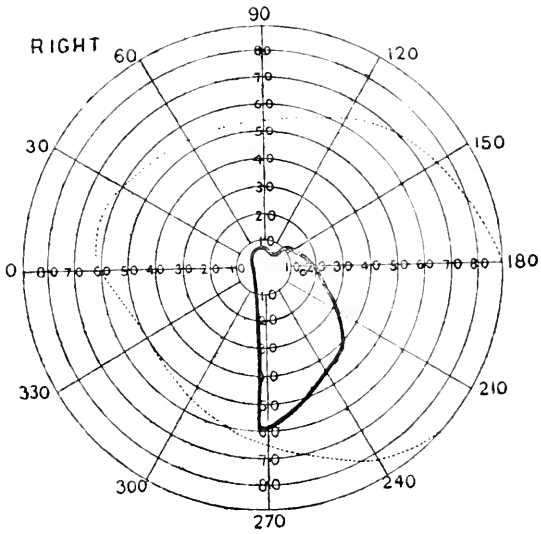


CHART I.

little or no swelling. The retinal vessels seemed normal in size and character; there was slight, but scarcely pathological tortuosity. Round the disc was a ring of irregular atrophy of the choroid, chiefly confined to the superficial layers of the choroid. The optic nerve showed no evident signs of atrophy.

The loss of vision being apparently much greater than could be accounted for by any visible ophthalmoscopic changes, his fields were taken with the perimeter in hopes of elucidating the nature of the case when a condition of binasal hemianopia, with contraction of the fields, was found to be present. See Chart I.

The urine was found to be turbid, and the turbidity was slightly increased on boiling; the addition of acetic acid did not clear up the turbidity. Heart: apex beat in the fifth interspace just outside nipple line, soft mitral systolic murmur. Hearing bad in both ears, but especially in the right; bone conduction particularly affected.

Treatment.—A mixture containing potass. iodid. gr. v. and tinct. nucis vom. ℥x, thrice daily was ordered.

April 12.—Two very small hæmorrhages were seen in the retina of the left eye near the disc, otherwise his condition was the same.

August 18.—R.V. $\frac{6}{6}$; was worse, he said. L.V. $\frac{6}{6}$ badly with + 1 D. Both fields were more contracted. Ophthalmoscopic appearances unchanged.

August 22.—Ophthalmoscopic appearances the same. Pupils noted by house surgeon to be of medium size, active to light and accommodation, and in the left eye there was a tendency to hemianopic pupil. Knee jerks exaggerated.

October 31.—V. same as before. Fundus unchanged. Fields further contracted.

February 16, 1895.—*In statu quo* except slight increased contraction of visual fields.

June 17, 1895.—I examined him carefully, when I found R.V. = fingers at one foot. L.V. $\frac{6}{6}$. Colour vision appeared good over visual areas in each eye. Fields slightly more contracted (see Chart II.) No difficulty in eliciting the

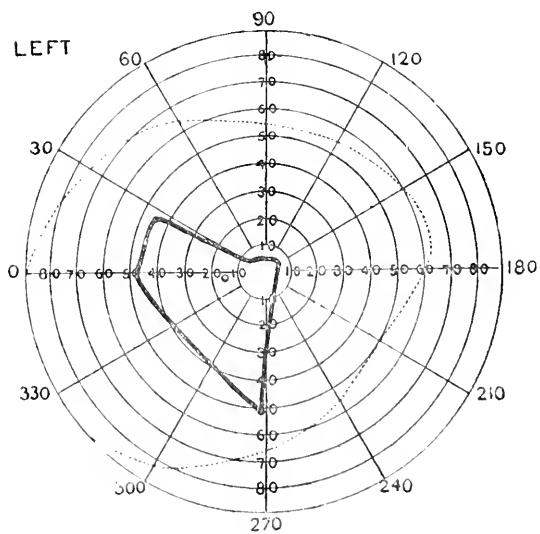
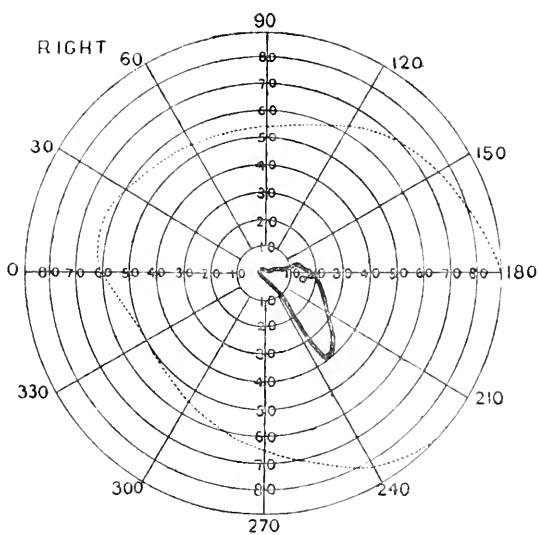


CHART II.

existence of "hemianopic pupil" in each eye. Pupils contract to light and accommodation. Medium and equal in size, measure $3\frac{1}{2}$ mm. facing light, $4\frac{1}{2}$ mm. in dull light.

With the ophthalmoscope the discs appear to answer almost exactly to the description of them made on the patient's first visit, except, perhaps, that there is now a little more appearance of atrophy, chiefly at the outer sides.

Careful examination with two candles, one being the fixed point of vision, showed the dividing line in the left eye to be clearly, but only just on the nasal side of the fixing point, and to run vertically down as in the chart, while in the right eye the limit of the visual field, except at the fixing point, was clearly on its temporal side below and above, thus showing that it receded as in the chart, and was no longer a vertical line.

Heart.—As above noted.

Urine.—Pale amber, feebly acid, turbid, specific gravity 1022. Faint increase of haziness on boiling, not lessened by addition of acetic acid; no sugar. Microscope shows numerous pus cells and squamous epithelium in deposit, but no casts.

Hearing.—At my request Dr. Lewis kindly examined his ears, and reported "bone conduction sufficiently impaired to point to labyrinth disease."

This case seems to me probably a fair sample of that admittedly most rare form of hemianopia—binasal. As regards the probable lesion in this case I feel I can hardly do better than quote the opinion of Dr. Gowers, to whom full particulars of the case with charts were forwarded.

Dr. Gowers writes as follows:—Aug., 1894. "The case suggests to me a bilateral inflammation of the trunks of the optic nerves in front of the chiasma, extending to this, and chiefly intense symmetrically at each side of the chiasma. The symmetry of interstitial inflammation in the nerves and nerve centres is remarkable. I think that nasal hemianopia has never been due

to disease behind the chiasma, and I cannot conceive that it could be thus produced. That the disease is there is strongly supported by the extension of the loss across the middle line above, while the fact that this extension is greater on one side is what we should expect since inflammation, although symmetrical, is seldom exactly so.

“The progressive diminution in the field is what would be expected from cicatricial contraction of the new tissue—it is quite unlike the effects of a growing tumour.”

It is impossible to form an opinion as to the cause of this affection. The urine, while indicative of cystitis, to which, no doubt, his frequent micturition is due, is not suggestive of Bright's disease, while his cardiac condition also is hardly diagnostic of that malady. On the other hand, he has no obvious signs of intra-cranial disease beyond the condition of his eyes. The state of the ears is apparently due to labyrinth disease, and not to any intra-cranial lesion. The condition of the optic nerve is not such as one commonly sees, but is evidently a rather anomalous one, and apparently due to a mild, chronic interstitial neuritis.

My thanks are due to Dr. Gowers for kindly allowing me to quote his letter, and to our house surgeon, Mr. Henry, for much assistance in keeping the record of the case.

NOTE UPON A CONDITION OF THE
PUPIL FOLLOWING EXTRACTION
OF CATARACT.

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WHILE examining eyes which had been operated upon by various surgeons as well as myself for extraction of cataract, as I have had occasion to see them, I have been impressed with a condition which has presented itself with such frequency that I am led to believe it must be more than a coincidence. In fact, so regularly has the condition in question occurred, that I have come to look for it in all cases. It is that the upper part of the pupil has been found to be the clearer. This is true whether the rest of the pupil is comparatively clear or whether it is occupied by a more or less dense opacity. The region in question is often of such small extent and so peripherally situated that it is quite covered by the upper lid and therefore useless for vision. Such a field of clearness as is thus often found here in connection with secondary cataract, if transferred to a lower portion of the pupil, would obviate the necessity of many an after operation.

The explanation of the condition noted seems to lie in the method commonly followed of opening the anterior capsule together with the usual delivery of the lens upward. A method of treating this membrane which shall permit the ready exit of the lens and at the same time insure against the formation of secondary cataract is still to be desired. Operators of great skill and experience admit the occurrence of such opacities

requiring further operation in from one-third to two-thirds of their cases. Accordingly, a number of different procedures have been devised to prevent or limit the necessity of subsequent interference. Graefe originally made two vertical incisions in the capsule, and later adopted the tactics recommended by Weber. This consisted in making two cuts along the pillars of the coloboma and uniting them by two transverse ones, of which one was placed close to the lower margin of the pupil, the other, from one to two millimetres below the equator of the lens; he hoped thereby to remove an approximately square piece of the capsule. After a short experience with this method he expressed well founded doubts as to the possibility of thus removing any portion of the capsule in any but the rarest instances. A specimen exhibited by Becker at a meeting of the Ophthalmological Society at Heidelberg (as long ago as 1875), gave an ocular demonstration of the manner in which the cystotome acts upon the anterior capsule. A number of indentations were found to have been made, but the membrane had only been perforated in a single line after repeated trials. Laurencó's experiments on animals as well as upon the eye after death gave similar results; of two diverging incisions, the first only was effective in opening the capsule, the second simply ploughed up the cortex of the lens, the latter making its exit through the large oval opening resulting from the first incision, whereupon the lips of the divided capsule re-united, and so laid the foundation for a secondary cataract.

From such experiments, together with a consideration of the conditions present it appears probable that the first incision in the capsule is, as a rule, the only opening we effect in that membrane with the cystotome. The retraction of the divided lips and the loss of tension prove effectual bars to its further disintegration. Where and how the first incision shall be made is therefore of

prime importance. This incision has usually been a vertical one, extending from near the lower margin of the pupil upward, or horizontally in the upper portion of the capsule. Some surgeons select the latter situation, as advised by Dr. Knapp, in order to retain within the capsule any cortical remains.

It has appeared to me that the superior clearness of the upper part of the pupil noted is due to the fact that the capsule is more thoroughly lacerated and cleansed of its cortical contents in its upper portion, by reason of the situation of the capsular incision, and the mechanical action of the upward passing lens during its delivery. The horizontal incision in the upper part of the capsule, or the vertical incision when it is the first opening which is sought to be made, both tend to favour clearness of the upper part of the pupil; the first in that the capsule is alone opened in that situation; while the vertical incision, even if it extend to the lower margin of the pupil, has the same result; the lens during delivery will separate the flaps laterally above, but there is no force to keep them apart below. In fact, with the expression of the lens the vertical flaps tend to come together and re-unite. It has seemed probable that a condition of clearness like that found at the upper part of the pupil might be secured for a more centrally situated area by carrying the first incision in the capsule to a point lower in the pupil and giving it a suitable direction. To meet the indication I have made the first incision in the capsule rather below the centre of the pupil and in a *horizontal* direction. The upper flap of capsule is then to be divided from above downwards, not with the cystotome, which is laid aside after the horizontal incision is effected, but with a Graefe knife or the incision knife of Dr. Knapp.

My actual experience with the method is still a limited one; I have tried it in a few cases, and believe that a clearer area has been secured in the centre of the

pupil than had been my fortune heretofore. In none of the cases in which the capsule has been treated in the manner described has there been any necessity for subsequent operations.

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- A. MARTI (Basle). Subconjunctival Injections of Common Salt in Destructive Ulcers of the Cornea. *Inaugural Dissertation, Basle, 1894.*
- C. MELLINGER and D. BOSSALINO (Basle). Experimental Study of the Diffusion of Fluids injected Subconjunctivally. *Archiv für Augenheilk, vol. xxxi., p. 54, 1895.*
- L. BACH (Wurzburg). The Staphylococcus Ulcer of the Cornea, &c. *Trans. of Internat. Ophthalm. Congress, Edinburgh, 1894, p. 133.*

Several papers dealing with the much-debated question of the efficacy of subconjunctival injections, beginning with that of Darier in 1892, have already been noticed in these pages (OPHTHALMIC REVIEW, vol. xi., p. 355; vol. xiii., pp. 96, 118, 342). This method of treatment has not, so far as we know, found much favour hitherto in England, but has many advocates elsewhere. The literature of the subject is already extensive, but the conclusions formulated are by no means in accord. Some of the latest observations appear to show pretty clearly that the germicidal power of the sublimate solution hitherto chiefly employed for subconjunctival injection has been over-rated, and that the beneficial effect, if any, is due rather to the action of the fluid in quickening the lymph currents in the affected tissues.

Marti's dissertation begins with a review of all the writings on the subject since the year 1866, when Rothmund, of Munich, recommended subcutaneous injections of common salt as a means of promoting the clearing of corneal opacities. He shows that a large number of ophthalmic surgeons have tried and approved Darier's principle of treatment. In the clinic of Professor Schiess at Basle, the use of sublimate injections was begun in 1892, and gave, especially in cases of hypopyon keratitis, satisfactory results; but it was attended with certain drawbacks, namely: pain, sometimes so severe as to render further injections impossible, and the production of inflammatory adhesions of the conjunctiva to the sclera in the region of the injection. Mellinger found, on experimenting with rabbits, that whereas stronger solutions of sublimate set up permanent inflammatory adhesions in the conjunctiva, a solution of 1-4000 had no such result. He therefore adopted this latter strength in treating the human eye, and found that while it was much better tolerated than the stronger solution previously employed it gave equally good results.

The success obtained with this extremely dilute sublimate solution suggested the probability that it was rather the fluid than the disinfectant as such that was the efficient agent. Experiments in which a normal solution of common salt was substituted for the sublimate solution appeared to confirm this idea. Stronger solutions up to 4 per cent. appeared to answer still better. Since December, 1893, these salt solutions have therefore been employed to the exclusion of the sublimate. The cases treated were chiefly those of destructive corneal ulceration. It is to be noted that the subconjunctival injections were not used as a substitute for the well established treatment by atropine and hot fomentation, but in conjunction with it; this of course depreciates the value of the evidence brought forward in favour of the newer method. Mellinger's conclusions, as formulated in Marti's dissertation, are as follows:—

(1) Subconjunctival sublimate injections act favourably

upon destructive corneal ulceration, but lead to adhesive inflammation and obliteration of the subconjunctival space.

(2) Subconjunctival salt injections render service of at least equal value, without the disadvantages of sublimate injections.

(3) The good results obtained by subconjunctival injections depend not upon a disinfecting action of the solution, but upon its quickening influence on the lymph circulation.

(4) The quickening of the lymph circulation causes a quicker absorption and elimination of the noxious material and thereby hastens the healing process.

(5) According to the experiments of Heidenhain common salt is among the most active of the substances which accelerate the flow of lymph; there is therefore a reasonable explanation of the good results which have been clinically observed.

In the second paper here under notice, Mellinger reports some experiments undertaken to ascertain the manner in which the injected fluid diffuses itself among the tissues in the orbit. White rabbits were employed. Subconjunctival injections of a sterilised emulsion of Indian ink were made, the canula being introduced parallel with the corneal margin. After four or five hours the black injected fluid had spread underneath the whole of the bulbar conjunctiva. On the following day it was visible beneath the skin all round the eye, especially in the upper lid and towards the nose. The iris, previously presenting the red appearance proper to the albino, appeared grey, but this proved not to be due to any real change in the iris itself, but to a diminished reflex from the fundus. The media remained perfectly clear. The ophthalmoscope showed a remarkable black discolouration of the fundus in small areas above and below the papilla, and a few smaller scattered black dots in other parts; the black discolouration lay beneath the choroidal vessels. This condition was completely absent in the non-injected fellow eye. Microscopic examination of the tissues revealed a very

wide diffusion of the fluid without any inflammatory change. The black particles had passed along the lymph passages surrounding the muscles and within Tenon's capsule. The greater part were found surrounding the globe and the optic nerve. Here and there they had found their way along the spaces surrounding the ciliary nerves towards the interior of the eye, and within the dural sheath of the optic nerve; they were not embedded in cells but free, and were extremely scanty in quantity as compared with the mass remaining outside the globe. The black patches in the fundus visible with the ophthalmoscope, were evidently due to the collection of ink behind the sclera and visible through it; their appearance exclusively above and below the disc is explained by the presence of opaque nerve fibres in the lateral directions. In order to ascertain whether the migration of the ink particles depended upon the action of leucocytes, further experiments were made with the heads of freshly killed and decapitated sheep. The injected fluid travelled and diffused itself as in the living rabbits. It never reached the interior of the eye.

From the foregoing experiments Mellinger concludes that the sub-conjunctival injections made for therapeutic purposes in the human eye pass backwards along the surface of the globe and optic nerve. He is disposed, moreover, to assume that the fluid enters, to some extent, the supra-choroidal space and the intra-vaginal space of the optic nerve.

Bach's paper read at the Edinburgh Congress, so far as it bears upon the subject in question, throws doubt on the efficacy of the method. A series of experiments was made. An ulcer was formed on each cornea of a rabbit by forming a pouch and inoculating with a pure culture of *staphylococcus pyogenes aureus*. The one eye was then treated simply with atropine, the other with the same quantity of atropine and sub-conjunctival injections of sublimate, according to Darier's directions. The conclusion arrived at was that no therapeutic value attaches to the injections. The irritation of the eye was increased by them and its

duration prolonged. Bach's sublimate solutions appear, however, to have been somewhat stronger than the 1-4000 now in vogue. He makes the further important statement that even in eyes treated by stronger injections the most delicate chemical analysis failed to detect any trace of the sublimate.

The outcome of these several observations appears to be that sub-conjunctival injections of sublimate do not owe their efficacy, if any, to the sublimate, but rather to the fluid, and that solutions of common salt are equally efficacious, if not more so, and less irritating.

P. S.

Some Recent Papers On Ophthalmia Neonatorum.

The subject of ophthalmia neonatorum is one which is brought under our attention by force of circumstances with a frequency which, however, appears to vary considerably according to the peculiar circumstances of the population among which one's practice lies. In regard to the question of treatment, there appears to be a wonderful unanimity of opinion in favour of the application of silver nitrate, but some of the papers recently published dealing with the subject show certain variations in the mode of its application and in the favour with which other remedies are looked upon. At a meeting of the Société d'Ophtalmologie (Paris), Kalt read a paper urging the usefulness of free washing out with permanganate of potassium (*Annales d'Oculistique*, December, 1894), employing a special "laveur," and two litres of tepid solution (1 to 5,000) for each eye twice a day. The important portion of the "laveur" is an ebonite tube expanding at right angles just before its termination; its shape thus allows it to be all the better retained and not extruded by the spasmodic

contraction of the lids, while the width of the circular portion introduced under the lids obviates any danger to the cornea. It is connected by a rubber tube with a reservoir, and the fluid is allowed to flow gently through it by raising the tank not more than 30 cm. above the level of the eye.

Lagrange's instrument for attaining the same result is simply a hollow Desmarre's elevator pierced with three apertures, and connected with a "head of water." This, inserted under the upper lid, gives thorough ablu-tion of the sac, and is so easily used that Lagrange does not hesitate to entrust it to the hands of lay persons. He uses boric lotion. Doyen (Rheims) employs simply a rubber bulb with a stiff rubber tube; this nozzle, smeared with vaseline, is inserted under the lid, and the sac washed out every hour or half hour. This also is considered quite safe in the hands of a lay person. Neither boric lotion nor Condy's fluid, nor quinine lotion, which Reich-Hollenden recommends (quoted in *New York Medical Journal*, April 6, 1895, from *Archives of Ophthalmology*), can be regarded, however, as reliable, when used alone. Burchhardt speaks highly of chlorine water, probably with justice (quoted in *Archives d'Ophthalmologie*, March, 1895). Nitrate of silver is used by some as a wash in weak solution; by others as a pigment, in strength varying from 1 to 4 per cent.; while a few employ the mitigated and even the pure (!) stick. Formol is earnestly recommended by Fromaget, in *Annales d'Oculistique*, February, 1895; it was first introduced for use in such cases by Valude, and appears to answer well when employed as a lotion (1 to 2,000), supplemented by painting with a solution ten times as strong. The weaker fluid causes no pain, but the application of the strong is decidedly painful. Valude and Fromaget, although they assert that they have seen cases do well under this treatment, which were not progressing favourably when treated in the classical manner, do not pretend that formol supersedes nitrate of silver. They very sensibly observe that in treating ophthalmia neonatorum we have two points at which to aim, viz., to destroy the cause of the evil, which

is well accomplished by painting with silver nitrate, and to render unsuitable the medium in which it has been growing, for which rôle formol is well fitted.

As a prophylactic Tarnier has, it seems, discarded Credé's method in favour of dusting in iodoform power, as advised by Valude, while for treatment of the disease when it arises he employs irrigation with Thebaic extract (1 to 10,000). (*Annales d'Oculistique*, January, 1895).

Keilmann has obtained good results by simply cleansing the exterior surface of the eyelids and their margins before the eyes were opened for the first time after birth, in place of adopting Credé's system.

There can be no possible doubt that some cases are much more malignant than others, and destroy the cornea more rapidly in spite of all care. The present author endeavoured at one time to discover whether the more malignant cases were truly gonorrhœal and the less malignant merely leucorrhœal, but the impossibility of obtaining authentic information even in a moderate proportion of cases became soon so obvious that the investigation had to be abandoned. Parinaud (*Annales d'Oculistique*, Dec., 1894), endeavours to make out a distinct form of infantile conjunctivitis differing in some respects from the ordinary variety. The special features are that the symptoms are not very acute; there is no chemosis, nor swelling of the lids, nor excessive secretion; the bulbar conjunctiva is usually but little affected, while that of the lids is velvety and roughened; the secretion is thinner, consisting not of pus but of increased lacrymal secretion with fibrinous shreds; coryza is present, and may interfere with lactation. The disease lasts from three to four weeks and is best treated with boric lotion; silver, lead and zinc are all unsuitable. Pneumococci are to be found in the secretion, but neither the gonococcus nor Weeks's bacillus.

The main part of Cohn's article in the *Centralblatt für praktische Augenheilkunde*, April and May 1895, is concerned with the evidence obtained by a Commission of the Schleswig Association in regard to the prevalence of ophthalmia neonatorum and the means to prevent it. They

find that out of 12,000 children born in Breslau in 1894, 250 (or 2 per cent.) were distinctly affected by the disease; nearly all of these being seen in hospital practice. The frequency of cases in eye clinics is variously estimated as from .5 to 1.2 per cent.; Silex found the proportion in the University Eye Clinic in Berlin to be 1.1 per cent. (quoted from *Zeitschrift für Geburtshilfe und Gynäkologie*, xxxi.) The Book of Rules for Prussian midwives draws attention to the danger in any case where the parturient woman suffers from blenorrhœa, and commands the midwife to invite the attendance of a doctor; in the event of his not arriving in time she is required to cleanse out the vagina thoroughly before birth takes place, to remove all traces of maternal secretion from the face of the child before the lids are opened, and to instil a drop of nitrate of silver solution 2 per cent. These proceedings are, it must be noticed, to be carried out only when there is suspicion of gonorrhœa. In Schleswig it is a punishable offence for a midwife to fail to report a case of purulent conjunctivitis, verbally or in writing; but this rule is not carried out thoroughly, and sometimes the summoning of a qualified person is discouraged by the midwives. The commission agreed, among other things, to request the magistrates (of Breslau), to issue a little paper of instructions, of which a copy should be given to all parents registering a birth during one year; the pamphlet is entitled, "On the Danger of Inflammation of Infants' Eyes; Advice to Mothers who do not wish their Children to become Blind." In Havre a similar proceeding is carried on, a booklet being given to the parents when a child's birth is registered. Fieuzal would have us take time by the forelock, and give an "Avis aux Parents" to each couple registering marriage! while Cohn wishes the subject taught in schools. Where anthropology is one of the subjects of tuition, the young idea might be instructed, but, he says modestly, "Natürlich kann in einer höheren Töchterchule nicht über den Tripper gesprochen werden." One would fain hope not. The doctors of Breslau have all signified their willingness to

treat every case of ophthalmia neonatorum gratis, so that no one may have any excuse for neglect; they hope it may be possible to stamp out the disease, and are determined to try.

W. G. SYM.

AUDEOUD (Geneva). Hereditary Nystagmus. *Annales d'Oculistique*, June, 1895.

The author reports the case of a girl, 10 years of age, affected with nystagmus from early infancy; inquiry into her antecedents elicited a remarkable family history of nystagmus, in addition to other abnormalities. This hereditary form of the affection being unusual, judging from the literature he has searched, the author has published details of his case and a genealogical table which includes three generations.

The patient, who was healthy and intelligent, was brought to the hospital on account of movements of the head, noticed from a very early age. The movements were rotatory, were not rhythmical, ceased during sleep, and were partially under control, *i.e.*, they could be lessened voluntarily. There was very marked lateral nystagmus. Vision in each eye was $\frac{1}{2}$, pupils equal, reacting briskly to light. Ocular movements were of full extent.

Ophthalmoscopic examination showed transparent media, and partial atrophy of each optic papilla, more evident in the right eye, thought to be consecutive to neuritis.

No abnormal conditions were found in the respiratory, digestive, and circulatory systems; urine normal. Occasional slight tremor noticed in the hands and feet.

The family history showed that in three generations, on the maternal side, there were, or had been, six other cases of nystagmus; in all the ocular tremors had begun in the first few months of existence, and had persisted during the life of the individual. In these six persons, as in Audeoud's

patient, there had been for a longer or shorter period tremulous movements of the head. The six relations of the child affected in this way were a brother aged 8 years, a male first cousin aged 18 months, a maternal aunt who died aged 23, the grandfather aged 63, a first cousin of the latter, and a distant cousin of the mother, both males.

The writer adds:—In such a family we should expect to find other neurotic conditions, and this proved to be the case, as is obvious from the following additional history: the first cousin, aged 18 months, who had nystagmus, was hydrocephalic; the mother and her sister were neurasthenic; the grandfather, who married his first cousin, was alcoholic and a hopelessly bad character; his wife was passionate, and the subject of migraine; two first cousins of the grandfather were epileptic.

The heredity of the author's patient on the paternal side is no less terrible; the father was alcoholic and brutal, an uncle alcoholic, the grandfather insane and committed suicide; of his three brothers one was insane, the second died by his own hand, the third was extremely eccentric (*bizarre*); the great-grandmother was alcoholic and insane; a first cousin had infantile hemiplegia.

The author was able to examine four of the relatives of his patient who were the subject of nystagmus. Of these five cases (including the child) three showed no ophthalmoscopic evidence of disease; in one there was partial atrophy of the optic papillæ, and in one a suspicion of atrophy; in three the acuity of vision was below normal, but without sufficient explanation in the appearance of the fundus oculi.

Audeoud concludes his report of this case by quoting Legraud du Saulle, who, in a treatise on hereditary insanity ("Folie Héréditaire"), wrote: "It is not so much in the mentally afflicted that nystagmus is met with as in their descendants. It is not uncommon to see very intelligent patients the subject of nystagmus, who have a family history of insanity or other neurosis. Nystagmus is a sign of a pathological heredity. It is a blemish which seldom exists alone, there are often other physical defects, e.g., facial

asymmetry. Obviously we cannot pretend to say that every subject of nystagmus will become insane ; all that we wish to assert is that nystagmus is one of the signs of a neurotic inheritance, and that it is met with nearly always in those whose ancestors showed some form of mental aberration."

The author gives a few references to cases of family nystagmus reported by Doumic, Nettleship, Owen, and Wood.

J. B. L.

G. E. DE SCHWEINITZ and A. G. THOMSON (Philadelphia). A Second Attack of Papillitis occurring in a Case of Post-Neuritic Atrophy of the Optic Nerves. *Archives of Ophthalm.*, xxiv. 2.

The rarity of second attacks of optic neuritis in cases of post-neuritic optic atrophy warrants a short record of the following case.

H. M. came in February, 1891, complaining of a series of epileptic attacks. The family history was a very neurotic one ; his own mental state was good, but he had suffered much from headache. There was no history of traumatism or syphilis, and no evidence of disease other than the epilepsy. Between December, 1889—the date of the first attack—and February, 1891, when he first came under observation, he had had seven fits, the last on the day before he sought advice. The note as to the eye condition at that time is as follows: "Pupils normal; optic discs of good colour; slight tortuosity of the retinal veins; very full lymph sheaths; vision normal. Macular region + 1 D." In May, 1892, *i.e.*, rather more than a year afterwards, his eyes were again carefully examined. "The discs were now slightly hyperæmic, their upper and lower edges veiled, the veins unusually full and the lymph sheaths markedly infiltrated; vision, accommodation and pupillary reflexes normal."

In March, 1893, double optic neurotosis was detected for the first time. Both discs were swollen (+ 3 D.); there were many fresh hæmorrhages on and near the swollen nerve heads; form and red fields normal. Vision—R. = $\frac{20}{15}$; L. = $\frac{20}{20}$. A month later the swelling of the R. had increased to + 4 D. and the left to + 6 D. Fields and central vision still normal. The patient was trephined over the right motor centres for tumour, but although the growth was thought to be localised it was not removable. The swelling of the discs gradually subsided, but macular changes, closely resembling those of albuminuria, set in; careful examination of the urine proved negative. By December, 1893, the typical appearances of post-neuritic atrophy were present, the pallor in the right disc being chiefly in the temporal half, while in the left it was general. Vision of R. = $\frac{20}{20}$; of L. = $\frac{3}{200}$. Fields full; colour perception good.

In November, 1894, the patient was seized with violent pain in the head associated with vomiting, and vision at once began to fail. No opportunity of examining his eyes occurred until January, 1895, when the note is, in substance, as follows:—Movements of eyes normal. No nystagmus; pupils dilated *ad maximum* and inactive. Absolute blindness. In the right eye the disc is swollen to + 6 D. (macula + 1 D.); the swelling is of a greyish colour, and most marked above and below; arteries smaller than normal; veins dark and rather tortuous, and with white lines on their margins. In the left eye the disc is also swollen to + 6 D. Previous macular changes still visible. Elsewhere the retina seems to be normal.

The authors think it likely that the original lesion—in their opinion probably a glioma—lay beneath the area exposed by the trephining operation; that in the interval between that operation and the present time the tumour has extended, the extension having been preceded by a period of relief both from headache and other symptoms, and that in the growth of the tumour the cerebellum may probably have become involved.

N. M. M.L.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

FRIDAY, JULY 5, 1895.

E. A. BROWNE, F.R.C.S.Edin., Vice-President, in the
Chair.

The Association of Certain Forms of Myopia with Disease of the Nose and Pharynx.—This paper was read by Dr. Batten. After referring to a former paper read before the Society in July, 1893, in which he held that certain constitutional diseases produced different kinds of myopia distinguishable from each other according to their cause, he proceeded to describe a special form of myopic fundus which he associated with certain diseases of the nose and pharynx. The chief characteristics of this form of myopia were : (1) the existence of localised posterior staphylomata at, or in the immediate neighbourhood of the optic disc, or on the nasal side of the fundus ; (2) the tilting of the optic disc in the direction of the staphyloma ; (3) the œdematous condition of the more prominent margin of the optic disc. This œdema, or “pseudo-neuritis,” he considered as secondary to and caused by the tilting of the disc. The conditions of the nose and throat with which he associated this form of fundus, were adenoid vegetations, enlarged tonsils, deviation of the septum, conditions resulting from blows on the nose and forehead, ozæna, syphilitic disease of the nasal bones, and chronic otorrhœa. He quoted cases in which myopia had immediately followed the onset of some of these conditions, and in conclusion said that the presence of the œdema was generally a sign that the cause was still in active operation, that the visual acuity was seldom good in these cases, even when the degree of myopia was low, and was especially bad when the staphyloma was to the nasal side of the optic disc ; the whole condition was one indicative of a progressive myopia, and the œdema and tilting both tended to disappear with the progress of the myopia.

The Chairman thought more evidence than was adduced in Dr. Batten's paper was necessary to convince those who had not specially studied the subject. Many factors, like previous attacks of scarlet fever, rheumatism, or rheumatic fever, would have to be eliminated. All these, as well as other exhausting diseases, were known to be sometimes followed by the onset or increase of myopia.

Mr. Spencer Watson thought it a pity that nothing had been put forward by Dr. Batten to explain the relationship between the cases of nasal disease and myopia; he had looked for some information as to the constitutional cause at the root of these affections. He had seen interstitial keratitis of syphilitic nature in which myopia had developed, and he regarded this as due to the softening of the whole eye by the disease and thus leading to its expansion. This would explain the association between the myopia and some diseases of the nose which may have a similar constitutional origin.

In reply, Dr. Batten said he had dealt with the constitutional causes in his previous paper; he had only brought forward some evidence in the present one. There was a close connection between the sphenoidal cells and fissures and the blood supply to the eye; in a measure the eye was to be regarded as an end organ, and interference with its blood supply was likely to lead to changes analogous to that produced in clubbed fingers.

Indian Oculist's Instruments.—Mr. Adams Frost showed a complete set of Indian oculist's instruments which had been presented to the Society by Surgeon-Captain Drake-Brockman, and described the method of operating. There was no attempt at asepsis or even ordinary cleanliness; the lower lid was everted, an incision made in the ciliary region with a lancet, and the lens was couched by passing an instrument through the incision. Most eyes were lost by panophthalmitis or secondary glaucoma.

Surgeon-Colonel Drake-Brockman commented on the difficulty of obtaining these instruments; they were handed down from father to son for generations. Fewer than 10 per cent. of the cases could be considered successful cures.

Card Specimens.—The following were shown:—Mr. E. H. Cartwright: Modification of Thomas's Arrangement of Holmgren's Wools.—Mr. Fischer: Symmetrical Ulcers of both Corneæ. Mr. D. Marshall: Double Enophthalmos.

Election of Officers.—The following were elected office bearers and members of Council for the session 1895-96; —*President*: *E. Nettleship. *Vice-Presidents*: Stephen Mackenzie, M.D., Henry Power, Edgar A. Browne (Liverpool), Thomas Barlow, M.D., G. Anderson Critchett, J. B. Story (Dublin), *John Couper, *G. A. Berry, M.D. (Edinburgh). *Treasurer*: George Cowell. *Secretaries*: Samuel Herbert Habershon, M.D., *John Bowring Lawford. *Librarian*: W. Adams Frost. *Other Members of Council*: M. A. Adams (Maidstone), Charles E. Beevor, M.D., *T. H. Bickerton (Liverpool), Ernest Clarke, M.D., *A. Deas Davidson, M.D. (Swansea), *E. F. Drake-Brockman, A. Hill Griffith, M.D. (Manchester), *Gustavus Hartridge, Joseph Nelson, M.D. (Belfast), *D. Argyll Robertson, M.D. (Edinburgh), A. E. Sansom, M.D., *James Taylor, M.D. *Honorary Member of the Society*: J. S. Bristowe, M.D., F.R.S. The gentlemen whose names are marked with an asterisk (*) were not in the Council, or did not hold the same office, during the preceding year.

THE BOWMAN LECTURE ON SUBJECTIVE VISUAL SENSATIONS.

Delivered before the Ophthalmological Society on June 14, 1895.

By W. R. GOWERS, M.D.Lond., F.R.S.

CONSULTING PHYSICIAN TO UNIVERSITY COLLEGE HOSPITAL ; PHYSICIAN
TO THE NATIONAL HOSPITAL FOR THE PARALYSED AND EPILEPTIC.

(Concluded from p. 202.)

SIGHT AND MOVEMENT.

The relation of sight to movement of the body is one of the obtrusive facts of animal life. I remember once watching a flock of wild swans on the river Axe, slowly moving on the stream in uniform position. Suddenly a small dog appeared on the bank a hundred yards away. Instantly every head was turned at the same angle, every neck was curved and inclined in the same manner. The uniformity was an instance in which the mechanism of life is a machinery such as man's invention may produce. The same visual impulse caused the same movement in every swan. In man the relation is familiar enough, but disordered action makes it more conspicuous, because the same process occurs in a different form. The relation is presented to us in some cases of epilepsy, in which the visual sensation precedes the motion which constitutes the fit. Instead of the motion that is seen, there may be a tendency to motion only slight enough to be felt. The motion is that of turning ; the sense of motion is that of vertigo. The visual aura of epilepsy may teach us something of vertigo. There are two primary movements of the body—progression forwards and rotation, walking and turning. The latter is the result of unequal activity of the centres in the two sides of the brain. If both sides act equally there is no turning ; if one side acts more, or only, there is turning from that side, first of the eyes and then of the head, and lastly of the whole body. In epilepsy

there is generally greater action on one side, and therefore there is this rotation, seldom of the whole body, commonly of the head and eyes.

Under normal circumstances, in ordinary life, the great cause of such rotation is the appearance of some object at one side of the field of vision. An object comes into view on the left side because it is moving towards the right. It is seen first chiefly through the right hemisphere. The visual impulse rouses the motor centres; the eyes and head turn towards the left to "fix" the object. But the object is moving towards the right, and the first movement to the left is followed by a movement towards the right, to follow it, until it disappears at the right edge of the field of vision. Then this long movement to the right is followed by a return to the mid-position by the action of the right centres. Note this alternation, and its necessary relation to the stimulation of the visual centres of one hemisphere from the opposite eye,—motor action first in that hemisphere, then in the opposite one, and lastly again in the one first active. Note that the second, opposite, activity is the longer, more extensive in its range.

Almost the first medical observation I published was that of a man with traumatic meningeal hæmorrhage over the left hemisphere. He had repeated convulsions, right-sided, which I watched for hours. In each the head and eyes turned strongly to the right as the fit came on. But this was preceded by a movement to the left, and this again by an initial slight deviation to the right. We have here, from irritation of one hemisphere, precisely the sequences just described. But compare with that active irritation the following case. A boy, at the age of 5, had sudden left hemiplegia during a severe general illness. Partial recovery was followed by recurring convulsions of the left, hemiplegic side. Each fit began thus: a slight movement of the head to the left, a much stronger and longer movement of the head towards the right, then a deviation again to the left, intense, as the boy passed into the convulsions. Here we have again the same sequence, but here we have an opportunity of discerning more of the

process. The patient came under observation as a most intelligent boy of 11 years of age, and described the following warning. The figure of a man suddenly made its appearance at the extreme left of the field, slowly moving towards the right. He felt compelled to try to look at it and to follow it, and did so until it disappeared at the right edge of the field. Then he lost consciousness, and knew nothing of the subsequent strong deviation to the left in the fit. The movement to the right impressed his consciousness, and was felt as conscious turning to the right, as vertigo. Here, then, we have these sequences distinctly associated with the action of the visual centre, and, apparently, the influence of this on the motor centre. Yet one other case. In this, each fit was preceded by the sudden appearance of a blue light on the left side, sometimes of two or three near together. These always moved slowly towards the right and a little upwards, and the patient felt compelled to follow them. The head and eyes were moved towards the right in this effort, as far as they could be, by strong tonic spasm in the muscles of the neck. This occupied about thirty seconds, and then suddenly ceased on the disappearance of the visual spectrum. The eyes and head, thus released, could be moved from the right, but this movement was continued towards the left as an involuntary movement, which was, however, far greater in the eyes than in the head. For nearly a minute the eyes were turned extremely towards the left, and the head only half-way from the mid-position. During this time he could move the head towards the right, but was absolutely unable to move the eyes from their extreme deviation to the left. Then he lost consciousness and the general convulsion of the fit came on. We have here again the same sequence, but the convulsion was not left-sided, it was general, and the final left-sided spasm had not the intensity which accompanies a left-sided fit. I could give other similar instances, but these may suffice to indicate the close relation of the head and eyes to activity of the visual centres. I may point out how indispensable, for understanding them, is the theory of the representation of both

fields in the higher visual centres and of their mutual action. We must conceive that the activity of the motor centre caused by a sensation connected with the opposite edge of the field has the stronger action on the motor centre of the same hemisphere, and that the sensation connected with the side of the field which corresponds to this hemisphere has the least action. Yet the absolute gradation and intergradation of the sensation and result is compatible only with visual centres functionally one.

MICROPSY AND MACROPSY.

The visual spectra, especially spherical lights, may seem to approach nearer and nearer, or to recede. In the same way, objects that are actually seen may seem to approach or become more distant. The increased distance is associated with diminished size and sometimes with dimness of sight, but a few patients whom I have closely questioned have been clear that the apparent increase of distance was not the result of any indistinctness of vision. It may be that there is an associated change in the position of the eyeballs such as occurs when the object becomes more distant. The apparent approximation generally goes on until the object seems so near as to overwhelm the patient, and then consciousness is lost, while the apparent recession of objects passes by dimness to the same result. It would seem as though the processes of discharge and inhibition may each have a peculiar form in which objects that are seen are perceived as nearer or further, with augmentation or diminution of size. This condition is of interest as comparable possibly to the sensation of movement which results from an activity of the motor centres too slight to cause actual movement.

MIGRAINE.

From the visual spectra of epilepsy we may pass to those of migraine, those which occur as the premonition of the headache which, from vomiting so often accompanying it, is called "sick headache," and is also known, from the affection of sight, by the suggestive popular name of "blind

headache." These constitute the second group of subjective sensations. The two groups present a marked contrast in most of their features, and yet are not without intermediate connecting forms. The epileptic sensation is extremely brief, and precedes loss of consciousness or convulsion; the migrainous sensation is deliberate, slow in evolution, occupying more minutes than the seconds during which the epileptic sensation exists. It is followed, not by a convulsion lasting minutes, but by a headache lasting hours. Yet, just as the epileptic sensation may occur alone as the slightest form of attack, so the spectrum of migraine may occur alone without succeeding headache.

Not only are these sensations longer in duration, but they present peculiar forms. The elementary features of the migrainous spectra are very few, although their combinations are most varied. They are always simple, in the sense that they are low in the scale of sensation in its relation to mind. No visions of faces, or objects, or persons, or places ever precede the headache. Yet the sensation, simple in character, is elaborate in form, the simple elements being developed in the most complex combinations, giving rise to spectra that are extremely curious, and will one day, I doubt not, be most instructive. But that day is not yet come. All I can hope to do is to stimulate others to the minute observation and description through which alone, at some time, it may be possible to discern the meaning which the phenomena must have, a meaning as profound and important as it is now mysterious. Our knowledge of these spectra dates chiefly from the careful description of his own sensations by Dr. Hubert Airy, which appeared in the *Philosophical Transactions of the Royal Society* for 1868, of which the plates have been reproduced in Dr. Liveing's admirable treatise on "Megrim," a book which will be regarded ultimately as one of the classics of the century. . . .

SPECIAL FEATURES OF THE SPECTRA OF MIGRAINE.

The spectra of migraine present as their most important feature the zigzag or angled character, which is well known

in its curved form, as the "fortification spectrum." Its projecting and re-entrant angles bear a resemblance to the plan which the French engineer Vauban first devised as the most effective for the defence of a fortress. The second peculiar feature is the combination of this angled spectrum with loss of sight, generally bounded by the luminous zigzag, or definitely related to it. The spectral appearances perceived by Mr. B——¹ form a curious explanation of this rule. They were never accompanied by any dimness of sight. The angled line of light is seldom straight in its direction. It may form an angled sphere or an expanding circle or oval, which becomes incomplete, or a curved line. It is seldom a single line; usually the chief line is repeated within its concavity, never on its convexity, by lessening lines, which seem to be fading reflections, approximating so as to blend as they fade into the darkness of the loss within. But in this reflection, as it were, the lines which constitute the angles are reproduced in a peculiar manner—very beautifully shown in Dr. Airy's drawings. The angles are always regular in size, and often become progressively less towards the end of the curved zigzag line which is nearest the central point of the field. But their junction is not always exact. They may even so meet as to intersect, and form a complex sort of *chevaux de frise* very strikingly depicted in some of Mr. B——'s drawings. The double or multiple rows give rise to a peculiar appearance. This will, I think, be found important whenever the time comes for the mystery of this angled form to be unravelled. I can offer no explanation for these angled lines, nor do I think that any explanation has ever been given. The conjecture has, indeed, occurred to me, but it is no more, that the form may be due to some struggle, or, if the expression may be pardoned, harmonious discord, between the higher visual centres in the two hemispheres, for it seems to me difficult to doubt that in these spectra both higher centres are concerned. One strange

¹ A former patient of Dr. Gowers.

feature which Mr. B ——'s exact observation has noted as frequently observed by him, is that, at the place where the intersecting lines reach their chief development, small circles of light occupy the interspaces between the crossing lines. They are not coloured.

COLOUR IN MIGRAINOUS SPECTRA.

The frequency with which colour is seen in the angled spectrum varies. It may be transient or constant; it may be occasional only, and then is slight, and confined, as in Mr. B ——'s experience, to trifling gleams where the angled element is most developed. It is most unusual for it to attain the extent and degree depicted in the diagrammatic drawings of Mr. B ——, and yet the care with which he has indicated its variations and also the unusual isolation of his spectra prevent us from dismissing his representations as too formal to be devoid of weight. Yet its presence and extent have more weight than its character. The trustworthy drawings of Dr. Airy show, however, that not only is colour, as in Mr. B ——'s figures, perceived chiefly in the part of the spectrum in which the angled character is most elaborate, but that it is chiefly confined to the part of the angled spectrum in which the most intense luminosity is apparent, to the outer edge. It must be noted that here we have a very strong bounding luminous line, while in Mr. B ——'s spectrum the chief development is by multiplicity of intersecting lines. Another feature is shown in Dr. Airy's figures: the colours always differ in the adjacent slopes of the lines. The contrasted direction of the lines is associated with a contrasted colour. We have, however, only four—red, blue, green, and orange; but we *have* four, and not the three or the six colours to which they are ultimately reduced in current theory. We must not, indeed, push too far such evidence, which can only rest upon memory. Still, the elaborateness and precision of Dr. Airy's drawings and the fact that the notes were made at the time, and the observations with purposed care, give them, I think, absolute weight. We must remember that we have here to do with the

“spontaneous” action of the brain such as may result from the influence of light on the retina. Every colour—that is, every varying rapidity of the waves of light—induces the impulses in the nerve structures which pass along the optic nerves; these impulses and the processes in the centres must present a close correspondence. All we know of colour is due to these impulses, is due to the activity of the centre, and it is possible that the study of the phenomena of colour perception from the centre may serve to decide some of the many uncertain questions presented by the study of the process in the retina, which alone has hitherto engaged attention.

FORMS OF ANGLED SPECTRA.

To reduce the various forms which the angled spectra assume into any instructive order, I have found to be impossible. All I can do is to group them into what seem the chief classes into which they may be provisionally arranged for the convenience of study, and to point out the manner in which the leading elements are presented by each. Some general facts may be noted in the course of the description. The central region seems that in which there is least tendency to the discharge which causes a luminous appearance. The luminous discharge becomes gradually less as it extends into the central region. Inhibition involves this part, but not discharge. This is the opposite to that which we should expect. We should anticipate that where function is most acute and intense, spontaneous over-action would be most readily produced. It is outside the centre that the chief displays occur. They may also develop at the periphery, but if we divide the field into the three zones mentioned at the beginning of this lecture we shall find that the middle zone and inner part of the peripheral zone are the regions in which the phenomena occur in greatest development. But there is no limitation. Various forms invade all regions, with the exception of the central region. The chief forms seem to me to fall into the following classes—all, it must be understood, presenting the angled form : (1) the Angled

Sphere, mobile or transient ; (2) the Expanding Sphere ; (3) the Progressive Curve ; (4) the Lateral Spectrum ; (5) the Secondary Limiting Spectrum ; and (6) a Concentric Spectrum, with, as its variety, the Arched Spectrum. I will begin with the first.

THE ANGLED SPHERE.

This is a nearly round spectrum composed of a series of projecting angles, plain or coloured. It commonly has a dark background, not much larger than itself. In every form the luminous spectrum seems to be composed of minute, brilliant points in rapid movement. This angled sphere does not change its size, but disappears as it appears. It is met with in three associations: (1) as an object which moves to and fro ; (2) as an isolated initial spectrum before some other ; and (3) as a terminal spectrum, thrown off, as it were, by that which has developed before. As a mobile object it was the feature of a curious case in which migraine passed into epilepsy, by no means a rare event. First, a round object appeared in the right half of the field below the horizontal line. It was composed of about six pointed projections which had the unusual feature (at least, as ascertained by careful questioning) of being pointed towards the centre. These were alternately dull red and dull blue. They appeared on a black background. This moved slowly towards the left, inclining upwards, so as to pass above the fixing point, to a little beyond the middle line, then returned to its starting point, retraced this path once or twice, and then passed to the right edge of the field, keeping the same direction, so as to come near the edge of the field at the lower outer part. Then it passed back again, only to a little beyond the spot at which it appeared, and then returned to the edge ; after two or three repetitions of the last course it suddenly disappeared at the spot at which it commenced. The patient kept the eyes shut during its appearance, but on opening them when it had gone, always found she could only see in the part of the field through which the spectrum had not passed. If she looked at a face a couple of feet from her she could only see the person's ear on her

left side, and all that was to the right of the ear could not be seen; in only the third of the field to the left was there vision. The loss of sight lasted about a quarter of an hour and gradually passed away. It is an instructive instance of the relation of the inhibitory loss to the region of the field in which the spectrum appears. The case shows how the central disturbance, though primarily unilateral, ignores the medial hemiopic line. The initial and terminal angled spheres will be mentioned with the spectra to which they are related.

THE EXPANDING SPHERE.

The most frequent form of migrainous spectrum, that which is commonly regarded as the typical one, is an angled sphere which expands into an oval, and, breaking, may enlarge into a curve. The stellate sphere appears on one side of the field, nearer the centre than the periphery. Its boundary outline retains the angled form, and this extends and increases in the size of its angles, most towards the periphery. Within it vision is dimmed or lost. Yet within the boundary zigzag the outer lines may be repeated, sometimes many times, with the semblance of reflection admirably depicted in Dr. Airy's drawings, in whom this spectrum was the common form. Colours are common in the outer line, and present the features mentioned. This form is accurately depicted by Mr. B—— as a faint spectrum, usually colourless, though colours were so conspicuous in most of his visions.

The expanding oval never reaches the centre. It breaks, and either the lower limb passes far away from the fixing point, while the other is directed towards it, or both pass beyond the fixing point. In either case the zigzag becomes narrower and its angles smaller in the limbs formed by the rupture. When one is directed towards the fixing point they cease to be recognisable, and the narrowing line always ceases before the fixing point is reached—a curious illustration of the resistance to discharge in this region. It is when such an expanding spectrum passes beyond the fixing point, dividing, as it were, for the

purpose, that the terminal angled sphere may develop. Just beyond the ends of the broken oval, towards the termination of the period of discharge, a stellate spectrum may appear, like that from which the expanding zigzag arose. It remains, however, unchanged until the spectrum fades. It is, as it were, an abortive attempt at a repetition of the process, as if on the other hemisphere, but it is too curious to justify even speculation.

THE PROGRESSIVE SPECTRUM.

An angled spectrum, like that which results from the rapid separation of the limbs of the expanding form last mentioned, may arise by progressive extension through a curve, in one half of the field, at the outer part of the middle or inner part of the peripheral zone. It presents features remarkably different from the expanding sphere, which it resembles in general form. A typical example is given in the careful drawings of Mr. B——, in whom it occurred in the same way, sometimes in one and sometimes in the other half of the field. There is no inhibition within the curve, as in the form last described. The first thing is a zone of darkness in the periphery of the lower quadrant. Then, above the inner part of this, a small, colourless star or angled sphere appears, to vanish when, from its neighbourhood, there develops a curved line of angles, small, and often intersecting lines. Their progress is upwards in a path concentric with the edge of the field, and may pass for a space as a sudden, straight, flash-like line, to resume the more deliberate zigzag form. It may pass beyond the middle line, in slight degree, in the upper part of the field, but attains its chief development in the upper quadrant of the side on which it began. There it presents the intersecting lines and small circles already mentioned, with slight tints of colour, chiefly red and blue.

THE LIMITING SPECTRUM.

The central region, as I have said, seems to possess peculiar resistance to discharge, although prone to inhibi-

tion. In the forms we have considered, in which inhibition is in direct relation to a primary spectrum, it is secondary. In one instance, carefully observed on himself by a member of our own profession, pure central inhibition was sometimes experienced, and was often limited by a spectrum in a very instructive manner. At the fixing point, a small, round or oval spot of darkness would suddenly appear, enlarging and becoming more intense at the centre. Its increase extended the loss of sight into the medial third of the field, from top to bottom, as simple loss. On each side it was then bounded by a soft edge which had the shape of a double curve, and in this form it remained, until with the onset of the headache it passed away. (You can scarcely fail to note how such a peculiar symmetrical medial loss of sight illustrates the essential unity of function of the higher visual centres.) But on many occasions the development of this spot of darkness was soon arrested on one side or the other, but always on one side only, by discharge. When the spot had extended to about half the vertical dimension of the field, a bright angled line appeared on one side, without colour, but limited by a narrow, black line on each side of the bright line. The zigzags which composed this were few and not regular. The central cloud increased and reached from top to bottom of the field; as it increased, the zigzag became more extensive, but did not move much from its first distance from the medial line, as if it interposed an obstacle to the development of the loss which it limited. On the other side, however, the loss spread more rapidly, and further than when there was no discharge, so that the ultimate result was extensive loss, bounded by a luminous line on one side, not far from the medial line, but on the other passing almost to the edge of the field. It was as if the resistance of the discharge had caused the inhibition to spread and diffuse itself over a much wider area. Symbolical as the words may seem, it is possible that they may be not far from the truth. Whenever this angled line of light appeared, the severe headache which followed was always on the opposite side to the spectrum, whichever that might be.

PERICENTRAL AND ARCH SPECTRA.

Although spectra scarcely ever develop at the fixing point itself, a spectrum around an object which occupies the fixing point is occasionally seen. A good illustration of this is presented in one of Mr. B——'s drawings, which is, I do not doubt, in this point quite trustworthy. A zigzag coloured spectrum suddenly surrounded a plate on the dinner-table before him. The quaint description he gives of it is this: "I remember well the phenomena appearing on the plate when I sat down to dinner with two friends. As I looked curious and nervous Mrs. B—— said, 'Why do you not carve?' On taking my eyes off the plate I said to them, 'The zigzag rainbow colours are gone out of the window.' This was the first time my wife and friends believed I saw something very extraordinary." The drawing shows that the spectrum surrounded the edge of the plate, and the same circular spectrum in a pane of the window at which he looked up. Concentric with the plate as first seen, it maintained the same form when he raised his eyes to the window, and then disappeared. This is instructive, because the spectrum was evidently determined by the actual stimulation of the visual centres.

A spectrum in the form of an arch, in the mid position, above the centre, was also a frequent experience of Mr. B—— and may be regarded as a segment of a pericentral spectrum. It is shown in one of his drawings as becoming divided in the middle, and there is a curious symmetry in the form on each side, by which the spectrum ceases. In both these forms we are compelled to think of the perfect conjunction in action of the two higher centres. Another form of this arched spectrum is shown in one of the diagrams as a sort of angled crown above the eye. It is a curious illustration of the tendency to regard these spectra objectively. The patient was a member of our own profession, and, in response to my request for a drawing of the aspect the spectra presented to him, he sent me an objective representation of his eye with the spectrum above it, in the position in which it could only be seen by another person. This involuntary sense of objectivity is a very curious feature.

THE LATERAL SPECTRUM.

One of the simplest forms of angled spectrum is that which appears at the true periphery of the field. It may be a short series of angles at the edge of the horizontal axis of the field or inclined. Moreover, it may extend in the manner described as that of the progressive spectrum, but, instead of progressing in the upward curve, as does that described in the middle zone, this peripheral spectrum, if it extends, curves downwards, as in Mr. B——'s curious figures. These also illustrate the tendency for such spectra to occur, in a similar manner, sometimes at one and sometimes on the other side, in corresponding form. His figures also show the strong tendency to regard a spectrum which appears in the periphery of the field to be at the extreme edge, even when it is so far from the edge as to permit of some further extension. You will also observe in Mr. B——'s drawing of what he regarded as the elementary forms of his "phenomenon," he represents a small lateral spectrum as attached to the outer junction of the eyelids. In one case an oblique lateral angled spectrum was drawn by the patient as commencing just within and extending beyond the limit of the field. It is clear that, even at the inner part of the peripheral zone, the spectrum seen seems as if it were quite at the margin of the field.

I have only touched upon the margin of the subject of this lecture. My hope is that this may serve as a beginning, that it may serve as a nucleus around which facts may gather, carefully recorded, carefully scrutinised, carefully sifted, and carefully classified. Only by such a collection of facts and observations, with discernment of the weight of correspondence can come, in time, any real knowledge regarding them. Alas, I must end, as I began, in ignorance, content if I have made you share my own perception of it. The knowledge of the way in which these spectra are produced, if time shall bring it, may bring us increased power to control not only them, but all of which they are the prelude. If I have opened the path for their systematic study I shall be more than content.

ON ERYTHROPSIA.¹

BY E. FUCHS, M.D.,

PROFESSOR OF OPHTHALMOLOGY. VIENNA.

I HAVE observed on several occasions that, after having wandered over snowfields for some hours, I have had erythropsia. Perhaps the most striking instance of this was in the spring of 1894, when I stepped into the hut erected on the top of a snow-covered mountain which I had just ascended. I saw everything around me red for some minutes, and other tourists following me into the room exclaimed likewise that everything appeared red. It was this experience that induced me to make some investigations on the subject last winter, but as my experiments are not as yet complete, the present communication must be considered only as a preliminary one.

I believe that any normal eye can get red vision if dazzled sufficiently by snow. The ease with which the erythropsia can be produced varies, of course, in different individuals, many factors, amongst which the amount of pigment in the eye is perhaps one of the chief, tending to influence the result.

In order to elicit the erythropsia, it is necessary to expose the eyes for some length of time to the glare of snow upon which the sun is shining. Erythropsia is a very transitory phenomenon, but if it has once been produced, and has passed away after a few minutes, a short exposure to the snow will prove sufficient to reproduce

¹ Read at the Annual Meeting of the British Medical Association, held in London, July, 1895.

it. For persons who acquire erythropsia with some difficulty, as is the case with me, a certain height above the level of the sea is an important factor in its production. I have never become erythropic in the plain except after artificial dilatation of the pupil. Most of my experiments, therefore, have been made on the top of a mountain near Vienna of nearly 6,000 feet elevation above the sea.

The best method of procedure is to expose oneself to snowlight for an hour or two, and then to pass into a moderately dark room—for instance, into a mountain hut. Immediately after entering it, the experimenter looks fixedly at a chess-board marked with black and white squares ; he must also have at hand a small black board, which, with the aid of a white mark, serves as a campimeter. The transitory character of the phenomenon renders observation difficult, and makes it necessary to repeat the experiments frequently and with different individuals. The principal results obtained in this way are as follows :—

Immediately after entrance into the obscurity, all dark objects, as, for example, the black squares of the chess-board, appear green, and very soon afterwards the white squares also assume the same colour. During the second quarter of the first minute the green tint begins to change into a red one. At first the white squares are seen red just at the point where they are contiguous to the black ones ; these red borders get larger and more intense until the white squares are shining red in their whole extent. Ultimately, even the black squares appear red if they are sufficiently illuminated, whilst in places where they are in darkness they still look green. It takes a minute, or perhaps a little more, after entering the dark room before the erythropsia is complete. Then the erythropsia increases rapidly, the colours become more and more intense, and then fade away as quickly as they appeared ; so that, after two or three minutes,

no more coloured vision exists. The colour of the erythropsia is bright, light purple, a colour which, as is known, does not exist in the spectrum. It is complementary to the green on both sides of the line F in the spectrum, which in this place is seen grey, if examined during the phase of erythropsia. It is evident that, during the erythropsia, all coloured objects change their colours accordingly; the green needles of the pines are of a pale grey, red wool appears a brighter red, and so forth. The transition to purple is often through orange; at least in many persons this is so. To them the borders of the white squares look orange before they become red, and in the same way the red colour, when fading away, passes through orange into white.

Let us turn now to consider what parts of the field of vision are involved in the erythropsia. I found that it extends as far as 10 to 20 degrees from the fixation point, and, as a rule, the farther from the fixation point the more intense the colour. At the outer limit, the red colour often passes through orange or yellow into the white periphery of the field of vision. The red is most pronounced in that part of the field which corresponds to the most dazzled part of the retina, that is to say, in the lower portion of the field. It was of especial importance to ascertain how the central parts of the retina are affected, because in the very first of my experiments I had found that the erythropsia was absent in the centre of the field. Further investigation by numerous experiments showed that in this respect different people vary considerably. If the erythropsia is very pronounced, the centre of the field, as a rule, appears just as red as, or only a little paler than, the periphery (in some cases it even looked more red). But if the erythropsia is less intense, or is already decreasing, then the white mark appears white on the black ground of the campimeter in a central area of 5 to 10 degrees diameter. I myself always saw the mark white in the centre, unless the

dazzling had been rendered exceptionally strong by dilatation of the pupil.

The erythropsia, in cases of aphakia, is identical in character with the erythropsia of normal eyes. It is stronger, however, and lasts longer. It is caused by dazzling, just as in the case of the normal eye. Last winter I induced a number of hospital patients, who had previously been operated upon for cataract, to take a walk in the large court of the hospital when there was snow on the ground and the sun was shining. Nearly all of them got erythropsia, which persisted for some hours, even for the whole day, and which in some patients recurred on the following morning after awaking. In these pathological cases also the individual disposition plays an important rôle; some people with aphakia become so easily and intensely erythropic that they are especially suitable as subjects for closer investigation of the phenomenon. The long duration of the erythropsia also greatly facilitates a careful and deliberate examination, and if the other eye of the patient be normal, with a healthy lens, an excellent opportunity for control experiments is provided.

The erythropsia sets in either a minute or two after the patient has entered a badly-lighted room or perhaps not for a quarter of an hour or more. During the next few hours it continues to increase, and may persist throughout the whole day; it is most pronounced in a moderate light. The long duration of the erythropsia allows one to determine its extension over the field of vision with the perimeter. In accordance with its greater intensity, it extends much farther into the periphery than in normal eyes. I found that in one case a large white square was seen red on the temporal side up to a point 55 degrees from the centre. In another case the erythropsia extended over the whole lower part of the field. The erythropsia is often more pronounced in some parts of the field than in others, and this increased intensity

usually corresponds to the section of retina which has been most exposed to dazzling, viz., the upper. In most of the cases erythropsia was also present in the centre of the field, but the red was there paler than elsewhere, and the centre became perfectly white during the period of decrease of the erythropsia. A small number of patients saw red as intensely, or even more intensely at the centre than at the periphery.

According to our experiments, therefore, we may state that the erythropsia of normal eyes, as well as of eyes deprived of their lens, is caused by dazzling, which need not be disagreeably strong, but must be of long duration. Exposure to sunlight reflected by snow is the most effective means of producing it. For most normal eyes it is moreover necessary that the dazzling shall take place at a certain height above the level of the sea. The sunlight is there stronger and also richer in short-waved rays. The production of erythropsia is facilitated by dilation of the pupil, and still more by absence of the lens. I believe that the latter protects the retina from dazzling, by rendering the light passing through it poorer in short-waved rays. Helmholtz has stated that these are absorbed by the lens in a higher degree than the other rays. Still more is this the case when the lens grows yellow by age. Finally the lens transforms by its strong fluorescence, short-waved rays into those of greater length. That the erythropsia has its origin in the retina is proved by the fact that, if only one eye be exposed to the dazzling, the erythropsia limits itself to this eye, and that it may be even unequal in the different parts of the field according to the different degree of dazzling.

In endeavouring to explain the phenomenon, we must first ask ourselves if it is to be considered as the positive after-image of the daylight, unusually intense from the prolonged action of the strong light. We know that daylight is not colourless, but red. But there

are several facts which plead against such an after-image explanation of the erythropsia. The most important of these is that the erythropsia is independent of the colour of the reacting light. To prove this the eye, while exposed to the snow-light, is covered with a glass. This must be of a faint tint, so that it does not intercept too much light, in which case it would entirely prevent the occurrence of the erythropsia. If, after entering the darkened room, the coloured glass be removed from the eye, the colour of the after-image is at once seen and slowly changes into the colour characteristic of erythropsia, which is invariably of the same purple, no matter what the colour of the glass might have been. It is evident that the erythropsia is a special phenomenon always presenting itself in the same way, and independent of the colour of the reacting light, provided that this should be strong enough to produce dazzling. To explain it there are two possible hypotheses.

I. If the retina be subjected to a strong light for a longer time than usual, the fibres of the retina which perceive the red ray have the power of retaining their sensitiveness to irritation longer than the other fibres.

If we adhere to Hering's theory, we ought to attribute a similar property to the red-green substance.

II. The other supposition, towards which, on the present amount of evidence I incline, explains the erythropsia by the supposition that the retinal purple becomes visible. This is usually not perceived, because it is always present in the retina, just as we cease to see red, if a red glass is worn before the eyes for a long time. By long exposure to strong light, however, the retinal purple is bleached and the retina becomes uncoloured. If we now pass into a dark room, the purple begins to regenerate and becomes visible. The modern view is, that the cones are the organs perceiving the colours. The cones contain no purple, but they are surrounded by purple-coloured rods, and the prolonga-

tions of the pigmented epithelial cells protruding between the cones and rods contain purple. In this way the cones may be illuminated by purple-coloured light from the sides. I may be allowed to mention only a few facts pleading for the retinal purple theory.

(*a*) The erythropsia is not produced by short dazzling, even if the dazzling be strong enough to be painful, but only by prolonged exposure to light, such as would bleach the retinal purple.

(*β*) The colour of the erythropsia is exactly like the colour of the retinal purple.

(*γ*) The erythropsia is as a rule less pronounced or entirely absent in the part of the field of vision which corresponds to the macula lutea.

(*δ*) The erythropsia is also perceived, if, after exposure to light, the eye is bandaged for five to ten minutes and then re-opened.

THE INFLUENCE OF THE CEREBRUM AND CEREBELLUM ON EYE MOVEMENTS.¹

BY J. S. RISIEN RUSSELL, M.D., M.R.C.P.,

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THE author was aware that the subject he proposed to deal with was of greater interest to the neurologist than to the ophthalmologist, but at the same time he felt that the importance of keeping all branches of medical research in touch with each other was fully

¹ Abstract of demonstration given at the Annual Meeting of the British Medical Association, held in London, July, 1895.

recognised by ophthalmologists, and that while upholding specialism they, as a scientific body, would be the last to encourage exclusivism. Under these circumstances it seemed needless to offer an apology to the section for bringing forward a communication which, if it had no other recommendation, could at least claim to be on a subject common to the ophthalmologist and neurologist, and therefore playing a part in bringing these two branches of medical science into touch with each other. He pointed out that some of the results brought forward support those which he brought before this section last year, while others introduced new problems which were not dealt with then, and, in conclusion, attempted to show how experimental results were to be brought into harmony with clinical and pathological evidence, so as to be of practical value in the localisation of disease in one or other part of the central nervous system.

There are few signs of greater practical value in the localisation of disease within the cranial cavity than this or that displacement of the globes. Alone they may teach us little in this respect, but taken in conjunction with other abnormal phenomena present they often furnish us with information which is of the greatest value.

He had found that even in the dog and cat it was possible to demonstrate the existence of distinct foci in the cerebral cortex related to each simple movement of the eyes. With all the external ocular muscles intact, the invariable result of the excitation of the frontal eye-area of the dog or cat was the movement of both eyes to the opposite side from the hemisphere stimulated; but when this movement was excluded by dividing the external rectus of the opposite eye and the internal rectus of the eye on the side of the hemisphere stimulated, it immediately became possible to demonstrate the existence of a focus, stimulation of which resulted in

simple upward movement of the globes. This was the only movement of the eyes that could be evoked as long as the muscles which raised the eyes were intact, but after their division, the existence of a focus, excitation of which resulted in simple downward movement of the globes, could be demonstrated. Thus the degree of representation of these simple movements in the cerebral cortex preserved a definite order, the lateral movements being most powerfully represented; the upward next in degree; and the downward least.

While the fact was beyond question that the various movements of the globes could be evoked on excitation of the cerebral cortex, evidence was adduced to show that the true action of these centres must be to initiate movement by their action on lower centres largely concerned in the production of the movement. In support of this contention it was shown that, after ablation of the frontal eye-area of one cerebral hemisphere, if the animal was subjected to the influence of absinthe, introduced into its system by intravenous injection, during the general convulsions which resulted no displacement of the globes, such as might have been expected, could be detected. Had the centres in the hemisphere whose eye-area was removed been solely responsible for the movement of the eyes to the opposite side, discharge of the intact centres in the frontal eye-area of the other hemisphere must, one would have thought, have resulted in displacement of the eyes to the side of the hemisphere which was without its frontal eye-area, for there being no discharge from the centres removed to counteract the influence of the intact hemisphere, it is difficult to see how such a displacement could be avoided. The fact that no such displacement took place was strong evidence in support of the view that these centres are only concerned with the initiation of movement, the chief motive force being supplied by lower centres. It was only in this way that the non-displacement of the eyes

during general convulsions could be explained ; for even if we supposed that other centres in the cerebral cortex subserve the same function as that subserved by those removed, it was clear that the removal of the frontal centres of one hemisphere must weaken the influence of that hemisphere, and that therefore the effect of discharge of the other hemisphere, with all its centres intact, must overpower the effect of discharge of the hemisphere minus some of its centres.

So too with regard to the influence of the cerebellum, Dr. Risien Russell had previously shown, in common with other observers, that ablation of one-half of the organ resulted in displacement of the eyes to the opposite side, a condition which he attributed to loss of some influence on certain of the ocular muscles, rather than to overaction of others. Now this being the case, it would have been natural to suppose that general convulsions induced in an animal after ablation of one-half of the cerebellum, resulting in discharge of all centres which have any influence on ocular movements, except those of one-half of the cerebellum, the displacement of the globes to the opposite side, the result of the ablation, would have been intensified, instead of which during such general discharge the position occupied by the globes was little altered from that common to them during general convulsions in an animal whose central and peripheral nervous systems were intact.

Clinicians and pathologists have long recognised that, in an irritative lesion of one cerebral hemisphere, the eyes are directed to the opposite side, while in a destructive lesion the eyes are turned to the side of the lesion. Displacement of the globes other than these, occurring in the course of some intra-cranial disease, directed attention to other parts of the nervous system and not to the cerebral hemispheres, but in the light of the experimental results which the author called atten-

tion to in the first part of his paper, it was quite possible for displacements of the globes, other than the lateral ones, to be of cerebral origin.

Inasmuch as similar lateral displacement of the eyes may result from a cerebral and a cerebellar lesion, it is most important that we should clearly recognise their exact association with other phenomena which result from lesions of these respective parts of the central nervous system. One example alone was taken in illustration of this point ; in a destructive lesion of one cerebral hemisphere with hemiplegia and ocular displacement, the paresis of the limbs is on the opposite side, while the eyes are turned to the side of the lesion ; whereas in a similar lesion of one half of the cerebellum, attended with paresis of one side of the body and ocular displacement, the limbs paresed are those on the same side as the lesion, while the eyes are turned to the opposite side.

Cases in which there is no actual displacement of the eyes as a result of a unilateral cerebellar lesion, but in which there is an inability to turn the eyes to the side of the lesion, might be confused with the results of a unilateral lesion of the pons, in which there is similar inability to turn the eyes to the side of the lesion, but in the latter case the paresis involves the limbs on the opposite side and not on the same side as the lesion, as is the case with the cerebellum. So that with a pontine lesion there is inability to turn the eyes away from the paresed limbs, while with a cerebellar lesion there is inability to turn the eyes to the side whose limbs are paresed.

The author's experimental results led him to conclude that displacement of the eyes, other than those already described, in a case presenting other evidence of cerebellar disease, pointed to implication of the middle lobe of this organ ; but that with indications of increased intracranial tension in such cases if inward displacement

of one or both eyes is present, the possibility of this being due to pressure on the sixth nerves must not be lost sight of in attempting to arrive at a correct diagnosis. Further possibilities were the secondary implication of the nuclei of ocular nerves by disease beginning in the cerebellum, or the secondary implication of the cerebellum by disease beginning in the nuclei of ocular nerves, considerations which make the diagnostic problem a very complex one. But as the middle lobe of the cerebellum is that most likely to be affected in such cases, the original statement with regard to ocular displacements met with in connection with this part of the organ, as opposed to the lateral lobes, is not materially affected.

HEREDITARY CONGENITAL NYSTAGMUS ASSOCIATED WITH HEAD MOVEMENTS.¹

BY ANGUS M'GILLIVRAY, M.B., C.M.

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THE following cases of hereditary nystagmus have come under my notice during the last five years, and as they possess some interesting features, which, to the best of my knowledge, have not hitherto been recorded, I venture to bring them before the notice of this Section.

¹ Read at the Annual Meeting of the British Medical Association, held in London, July, 1895.

A. THE NEILSON FAMILY.

In the first series of cases, which amounts to eight at least, the nystagmus is associated with head movements, and can be traced with certainty through four generations, and there is some reason to think that it appeared also two generations earlier than our precise information extends. The tradition of the family affords presumptive evidence that one of the grandparents of Alex. Neilson (No. 1. See Chart) suffered from the same disease, but there is no positive proof of this.

Of those affected I have examined the six who are alive, and find that the nystagmus is of a well marked lateral or horizontal type in both eyes, and readily recognisable except in one case, which, while very evident in upward rotation of the eyeballs, or by the aid of the ophthalmoscope, is at times so slight as to escape casual observation.

The first case that came under my notice is that of Alexander Campbell (No. 3, see Chart), who presented himself at the Dundee Eye Institution on May 16, 1893, to be tested for glasses. A well marked lateral nystagmus in both eyes being at once noticed, he promptly informed me that he was sure nothing could be done for that affection, since it was in the family. He inherited this "nerve in the eye," as he called it, from his maternal grandfather.

FIRST GENERATION.

Alexander Neilson, the grandfather, was a well to do Fife coal miner who lived to the age of 50; he married Agnes Maiden (who lived to be nearly a hundred), and by her had twelve children, six sons and six daughters. In addition to nystagmus, he suffered from lateral movements of the head, which became very marked when he read. Through information gathered from one

of his daughters, who is still alive, I ascertained that the head movements were much slower than those of the eyeballs, and that both conditions were present for as long as she can remember. From this and from other investigations I was led to believe that the nystagmus was congenital and not acquired from his occupation as a coal miner, but of course there is no conclusive evidence on this point.

SECOND GENERATION.

In the second generation, *i.e.*, in Neilson's family, we have six sons and six daughters, all unaffected, although, judging from the number, there was ample opportunity of showing their father's peculiarity. Nevertheless, in two of the female members of the family the condition remained latent, for through them, it was transmitted to the third generation, and there becomes manifested in three cases.

THIRD GENERATION.

In the third generation we find the nystagmus occurring in the two families of two of the daughters, namely, Mrs. Campbell and Mrs. Bremer.

(a) *The Campbell Family.*

Two cases of nystagmus. *The eldest* is *Agnes*, or *Mrs. Prophet*, who not only had nystagmus, but also head movements. She died at 44, having had three daughters, all of whom are dead.

The second—*Mary*, or *Mrs. Gray*, is married and has ten of a family. She herself is free from nystagmus, but hands it on to two of her boys.

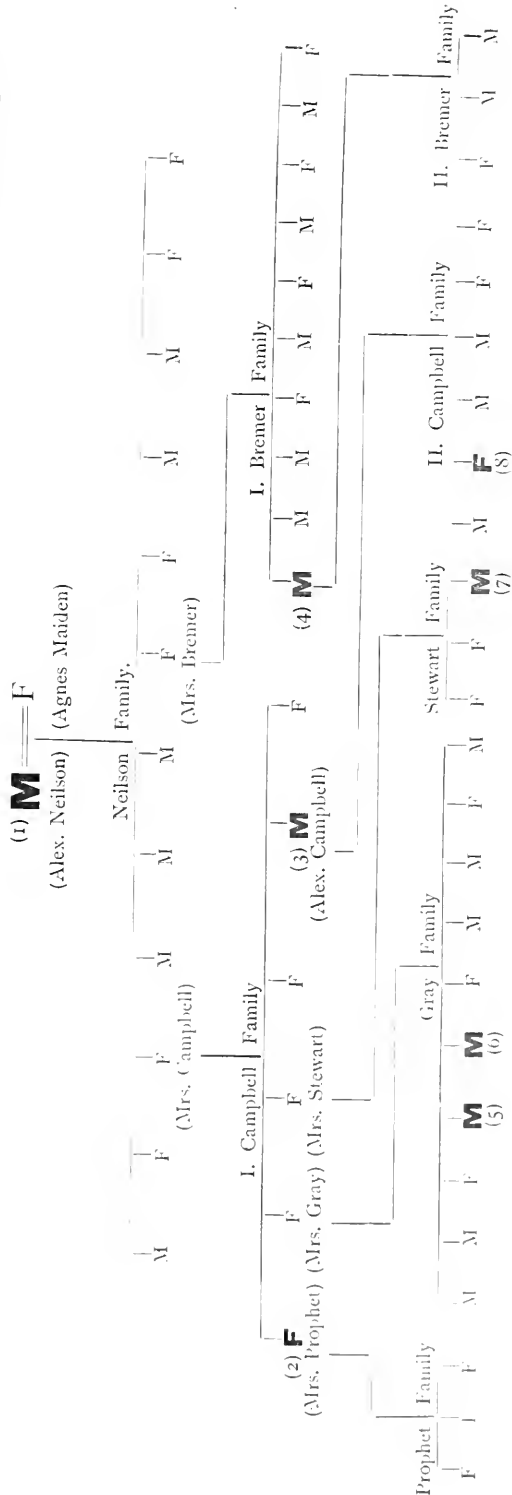
The third—*Margaret*, or *Mrs. Stewart*, married, family of three (two girls and one boy). She is free from nystagmus, but her son is affected.

The fourth—*Kate*, died at the age of 10.

M=Male.

F = Female.

The thick letters signify those affected with Nystagmus.



The fifth—Alexander (the first of the series seen by me), aged 39, has nystagmus with lateral head-movements, married, has six of a family, the second child—a girl—being affected like her father. Beyond the nystagmus and head-movements, no abnormality was detected in his case. R.V. = $\frac{6}{24}$, L.V. = $\frac{6}{18}$. Slight myopic astigmatism, dark coloured fundus, optic discs normal.

The sixth—Jessie, married, died leaving no family.

(b) *The Bremer Family.*

One case of nystagmus, namely, *William*, aged 38. The nystagmus is especially well marked on extreme conjugate deviation to the right. While reading his head shows pronounced rotatory movements, as if on an antero-posterior axis through the centre of the head. R.V. = $\frac{6}{60}$, L.V. = $\frac{6}{60}$. Myopic, slight posterior staphyloma in left, dark coloured fundi, otherwise eyes are normal. He has three children, unaffected.

FOURTH GENERATION.

In the fourth generation we have four cases of nystagmus—two in the Gray family, one in the Stewart family, and one in the Campbell family. Only those four cases having nystagmus need be alluded to.

1 and 2.—*David* and *James Gray*, aged 18 and 17 respectively, are the fourth and fifth sons of a family of ten. In these two boys the nystagmus is very marked, and so also are the head-movements. The latter consist of a nodding movement, followed by lateral rotation to the left, then upwards, thus roughly describing a circle, a lateral vibratory tremor being added to the principal, *i.e.*, to the circular movement. *James* is myopic, and *David* is emmetropic. Both are rather slimly built, but are strong, healthy and intelligent.

3.—*James Stewart*, aged 19, is the only son of a family of three. He has well-marked lateral nystagmus with head-movements. Otherwise he is perfectly healthy.

4.—*Agnes Campbell*, aged 13, second child of Alexander Campbell, our patient. In her case the nystagmus is only slight, but on looking upwards, it became very rapid. She has also head-movements from side to side, but these are only occasionally noticed. She is a well-developed, bright and happy-looking girl.

R.V. = $\frac{6}{18}$, L.V. = $\frac{6}{12}$. Fundi dark coloured, normal. Slight myopia.

In all the members of this family tree that are affected with nystagmus and head-movements, I have been unable to find any history of syphilis, hereditary ataxia, disseminated sclerosis, consanguinity, albinism, fits, chorea, or ophthalmia neonatorum. The nystagmus and head-movements were observed at birth, and both conditions were present in all the cases, and as far as we can learn, were not associated with dentition, nor protracted or instrumental labour. No other congenital anomalies could be discovered, either in the affected cases or in those unaffected whom I have examined. All were well developed, both mentally and physically.

On glancing at this family tree, there are several points which may interest us. Probably the most striking at first sight is the presence of the disease in the first generation (1), its absence in the second, and its appearing again in the third and fourth, thus skipping in three cases (2), (3) and (4), one generation, and in three other cases (5), (6) and (7), two generations. We have then in this family a well-marked instance of atavism, where the peculiarity of a progenitor appears in successive generations, one or two generations intervening being exempt.

With reference to the transmission of the condition as to sexes, the rule in the Neilson family appears to be through the females, as is seen in six of the cases, (2), (3), (4), (5), (6) and (7), there being only one exception, namely, Agnes Campbell (8), where the transmission took place through her father (3).

As to the sex affected, throughout the four generations the males are in excess of the females, the proportion being 6 to 2.

The way in which the nystagmus in this family is transmitted through the females to the males closely resembles the method of transmission in the hereditary hæmorrhagic diathesis or hæmophilia, when the condition is transmitted from the grandfather through the mother to her sons, thus missing one generation. According to Osler ("Principles and Practice of Medicine," pp. 321), "the" hæmophilic "affection is much more common in males than in females, the proportion being estimated at 11 to 1, or even 13 to 1." It will, however, be very evident from the chart that the proportion of females affected with nystagmus is considerably in excess of those affected with hæmophilia as recorded by Osler. Yet it is worthy of note that in the case of Agnes Campbell (8) of the fourth generation, the nystagmus, which, according to the hæmophilic rule, should lie latent, is present but of a decidedly less pronounced type, and further, the head movements are not so well marked as in the other cases; in fact they are only occasionally observed.

With regard to the method of transmission, nystagmus also closely resembles that found in pseudo-hypertrophic paralysis. According to Byrom Bramwell ("Diseases of the Spinal Cord," 2nd ed., pp. 339): "Boys are much more frequently affected than girls" (with pseudo-hypertrophic paralysis). "In a considerable number of cases the disease is hereditary, and it presents the remarkable peculiarity that while the females of a family suffer much less frequently than the males, the disease is almost exclusively transmitted through the female line."

Many cases of hereditary nystagmus with head-movements bear also a very close resemblance to some of the cases recorded by Hadden in a paper "On Head Nodding and Head Jerking in Children commonly associated with

Nystagmus" (*Lancet*, i., 1890, pp. 1293, 1349 & 1410), and also to some of the cases described by Henoch under "Spasmus Nutans" (Nodding Spasms), ("Lectures on Diseases of Children," New Sydenham Society, p. 192), and again to cases recorded by Ebest and Demme, and others, with this exception, that in our cases the nystagmus and head-movements continue throughout life.

Like Hadden's cases the nystagmus in the Neilson family is much more rapid than the head-movements; both having an independent rhythm, and the head-movements, as in his case, cease during sleep. The ocular movements were unaffected.

In some of Eadon Norrie's cases stiffness was observed (*Lancet*, ii., 1890, p. 1264); not so in ours.

There was no history of malnutrition. The onset, both of the nystagmus and head-movements, was simultaneous and without any apparent cause. In the paper already alluded to, Hadden states that, "it is interesting to compare these head-movements in children with adult tremors of the head which often occur in aged people." A few days ago I happened to see a case of spasmodic torticollis in a gentleman of 67, which came on at the age of 60. He had high hypermetropia, astigmatism, albuminuria, and slight optic neuritis. His head is turned to the left side, and is in a state of constant jerky tremor. In his case there was no nystagmus, but the jerky movements of his head so much resembled those of certain members of the Neilson family, and also some of the other cases to which I have referred, that I take this opportunity of thus briefly alluding to his case.

Without attempting at the present time to offer any pathological explanation of the Neilson family affection, I may simply suggest that such cases which are congenital and persistent throughout life seem to form a sort of connecting link between Dr. Hadden's series of

interesting cases in children and those tremors found in the aged, the pathology of all of which is still *sub judice*.

[Since this paper has been written, Mr. Snell, of Sheffield, has very kindly directed my attention to a paper by Mr. Lloyd-Owen in the OPTHALMIC REVIEW of 1882, p. 239, entitled, "An Illustration of Hereditary Nystagmus." On referring to it I was interested to find that there is a great similarity between the cases of nystagmus in the family mentioned by Mr. Owen and those in this Neilson family. The nystagmus appears in nine cases and is traceable through four generations. I find from the tabulated pedigrees that two of the cases were associated with head-movements; and that in four of the cases two generations are skipped. The second generation is exempt. Transmission is through the females to the males without any exception. The nystagmus was also observed at birth.

B. THE GORRIE FAMILY.

This series consists of four cases of *Lateral Nystagmus* in one family, one of them being associated with head movements. There are nine of a family (two girls and seven boys) all of whom are healthy, bright, well-developed and intelligent children. The eldest is a daughter, age 22, and the youngest a boy, age 7, there being a difference of two years in age between each member of the family.

The nystagmus is well marked, and appears in the two eldest and two youngest but one (one girl and three boys being affected). The father is alcoholic. There is no history of syphilis, albinism, chorea, fits, consanguinity, ophthalmia neonatorum, hereditary ataxia, malnutrition, or of difficult labour. The mother has convergent strabismus. She nursed each of her nine children for 14 months.

Only the cases of the four affected with nystagmus need be mentioned; the others have been examined and nothing abnormal detected, except in the case of the fourth and fifth children, both of whom have strabismus, the former divergent, the latter convergent.

Cases with Nystagmus (grey irides). 1. *Catherine* (the eldest) has light-brown hair; R.V. = $\frac{6}{36}$, L.V. = $\frac{6}{36}$.

Hypermetropic astigmatism (compound), improved slightly with glasses. Her nystagmus is decidedly less since she has used glasses constantly. The fundi are normal; choroidal vessels well seen.

2. *John*, the second of the family, aged 20, has light-brown hair and grey irides, well-marked lateral nystagmus and constant lateral movements of the head as in most of the former series. These head movements are more marked while reading, and appeared spontaneously with the nystagmus. The head movements can, however, be brought to a stand-still if the patient's attention be arrested. R.V. = $\frac{6}{36}$, L.V. = $\frac{6}{24}$, improved to $\frac{6}{18}$ with glasses. Hypermetropic astigmatism (compound), fundus light coloured.

3. *Edwin*, the seventh child, aged 11, light-brown hair, and grey irides, lateral nystagmus. R.V. = $\frac{6}{24}$, L.V. = $\frac{6}{24}$, mixed astigmatism. Light-coloured fundus.

4. *Stephen*, the eighth child, aged 9, lateral nystagmus, light-brown hair, and grey irides. R.V. = $\frac{6}{36}$, L.V. = $\frac{6}{60}$. Hypermetropic astigmatism (simple). Fundus differs from the others in showing only a few choroidal vessels.

In these four cases we have a well-marked instance of *family nystagmus*, for which no cause can be assigned. In three of the cases affected the fundus is light-coloured, approaching that of the albino. In the fourth case the fundus shows only a few choroidal vessels, and further we have the same type of light-coloured fundus in three of the children who are not affected with nystagmus, so that we may reasonably assume that the nystagmus is not in any way connected with albinism. In all the four cases there is well-marked astigmatism, chiefly hypermetropic, while in the former series no special form of ametropia is outstanding.

The second case has head-movements, and is interesting inasmuch as it bears a very close resemblance to the cases in the first series.

Snell, in his exhaustive treatise on "Miners' Nystagmus," at page 7 refers to three brothers who are affected with (coal miner's) nystagmus. He also refers in the same paragraph to two instances at least of two brothers being affected, and a father and son more than once.

My colleague—Dr. Mackie Whyte—has at present under his care five cases of nystagmus in one family, three of whom, however, suffer from hereditary ataxia. I am indebted to him for permission to thus allude to his cases.

As it seems to me to be rare to find as many as four cases of idiopathic nystagmus in one family, I have taken the opportunity of referring to these instances of family nystagmus; contrasted with the former series of cases of hereditary nystagmus they are of considerable interest.

ROCHON-DUVIGNEAUD (Paris). A Contribution to the Study of Œdematous Neuritis of Intracranial Origin. *Archiv d'Ophthal.*, July, 1895.

Two necropsies in cases of cerebral tumour with papillary œdema are made the ground-work of this paper. Case 1 was that of a girl aged 20, who had long complained of her sight; typical œdematous papillitis had been observed during life. At the *post-mortem* examination a glioma of the right Rolandic area was found; the nerve sheaths were distended by œdema, which diminished as the apex of the orbit was approached, and was scarcely marked in the bony canal. Various well-marked changes in myelin, &c., with which we need not concern ourselves at present,

were observed in nerves, chiasma, and tracts, but the subarachnoid tissue, distended though it was by œdema and directly *en rapport* with the liquid supposed to be infective (Deutschmann), was entirely free even of microscopic signs of inflammation. Any slight thickening of the pia mater and connective tissue trabeculæ, the author considers to be merely compensatory to the shrinking of the nerve substance, which was in a state of ascending atrophy without inflammation as high as the tracts. While normal in the nerve, the vessels suffer in front of the lamina cribrosa from perivascularitis, the veins being as much affected as the arteries, but there is no strangulation of vessels at the scleral ring, a fact which rather militates against von Graefe's theory of this ring acting as a constricting agent. The second case was that of a young man who died of a cerebral glioma. Two years after the first symptoms of headache, vomiting, epileptiform attacks, &c., papillitis or typical choked disc appeared for the first time. *Post-mortem*, there was found no increase of intracranial fluid; the pia mater was acutely congested; there was no flattening of convolutions; a gliomatous mass was found affecting the anterior of the corpora quadrigemina and the right cerebral peduncle. Microscopically, œdema of the sheaths of the optic nerve was observed, but not by any means to so great a degree as in Case 1; there was no inflammatory exudation in the œdematous subarachnoid tissue, but the trabeculæ of it are a little swollen; a decided increase in volume on the part of the optic nerve itself was noticeable, due in part to œdema of the sheaths, in part to abundant proliferation of cellular tissue, especially the nerve tissue itself. The nerve was so distinctly swollen that in the canal where it had no room to expand, it presented the appearance of being actually constricted.

The lesions found in these two cases present appearances which are analogous though not the same, and both present stages of optic neuritis relatively of old standing, or at all events, at stages of considerable advancement. It seems clear that the affection, beginning at first as papillary œdema, is arrested by the lamina cribrosa: but

at a later stage passes this barrier and proceeds along the optic nerve. Of the two cases related, one represents the aggressive active form, or stage, the other the later, regressive or atrophic. The lesion has not an inflammatory character to begin with, and the facts that proliferation of connective tissue may be entirely absent, and that vision is often at first, and even for a long time, quite unchanged, seem to point in this direction also ; so also the rapid cure in some cases and other circumstances.

Pathogeny.—One fact dominates the history of papillitis, viz., œdema, though certain affections very varied in nature and in situation may bring it about. Not only cerebral but orbital causes may produce it. Of all causes, that of cerebral tumour is the most frequent, but there are cases of tumour without papillitis and of papillitis without tumour. Next in frequency to tumour comes cerebral gumma, then meningitis, &c., and last of all comes abscess. The author now proceeds to discuss the various theories of the causes of papillitis, remarking that this disease is the only ophthalmoscopic alteration presented with certainty in brain disease, and it is the sole remains of the vaunted cerebroscopy.

We can no longer accept the early explanation of Türk, viz., compression, direct or indirect, of the cavernous sinus by the tumour and resulting stasis, even when supplemented by the ingenious theory of von Graefe as to the intensifying action of the scleral ring. Von Graefe was familiar only with the choked disc ; the œdema of the sheath dates only from the writings of Schmidt and Manz in 1869-71. The former, utilising the then recent researches of Schwalbe, who satisfactorily made out the communication between the intravaginal space of the nerve with the subarachnoid space, pointed out that the increase of pressure caused by the tumour confines the fluid in the sheath and so raises the tension there and causes venous stasis. The œdema of the papilla is explained by the oozing of the fluid in the sheath through the lamina cribrosa and its imbibition by the papilla. Leber, who had admitted the increased tension and the dilatation of

the sheaths by the fluid dammed back, demanded (1877) why an inflammation and not simply a stasis was produced. Parinaud, in a thesis of the same year, propounded the view that stasis is not an essential feature, but that cerebral and papillary œdema were of the same nature ; the œdema of the nerve in optic neuritis ought to be regarded as having a lymphatic rather than a blood-stasis origin. Working by experiment, he was led to doubt that compression of the brain could modify the circulation in the fundus, at least in a purely mechanical manner ; by injections, under constant pressure, of Prussian blue into the skull of the rabbit he has demonstrated, penetration of the fluid into the ventricles, subarachnoid space, and sheath of the nerve, but not œdema of the papilla. Leber, endeavouring to find the reply to the query which he had previously put forth, suggested (1881) that products of nutritive interchange found their way from the tumour or the zone of surrounding congestion, and acting as an irritant, produced neuritis or papillitis when they arrived at the end of the *cul de sac* of the intervaginal space of the nerve. In 1887 Deutschmann published the results of certain experiments made to determine the influence of increased intracranial tension ; he had succeeded by increasing the tension in producing a (very temporary) optic neuritis, when he used an aseptic fluid ; but when he employed tuberculous pus, the inflammation was much more acute and persistent, and left behind it an atrophic nerve. He considers his view to be considerably strengthened by the successful result of these experiments.

There are thus three theories at present in the field, first, that of Schmidt and Manz ; second, that of Leber and Deutschmann ; third, that of Parinaud, who regards "optic neuritis" as forming one with the cerebral œdema. Adam Kiewicz found that increasing the tension neither raised nor lowered the pressure in the carotid and jugulars, and the increased pressure has no effect upon the cerebro-spinal fluid, inasmuch as the communications between the intra-cranial cavity and the surrounding parts are so free ; by merely increasing the pressure he has not succeeded in

producing papillitis. If the dropsy of the nerve sheaths be a consequence of increased tension of the arachnoid fluid, why does not the spinal cord suffer, for the communications here are much freer than with the optic nerves? Neither the author nor Auscher has ever found any analogous affection of the cord *post-mortem*, though it has been searched for with care, in cases of cerebral tumour with papillitis.

It is doubtful, then, whether the fluid contained in the subarachnoid space of the nerve has come from the cranium. One must recollect also that the dropsy of the sheaths might result from the arrest of an ascending current. The author has serious difficulty, too, in accepting Deutschmann's theory, in spite of his success; for if one considers the etiology of papillary œdema, the pathological anatomy in the early stages, and the complete disappearance of the condition when the cause is removed, it is difficult to believe that infection can be the determining cause. Deutschmann has produced in the rabbit an infective neuritis of which the development is by no means identical with that of the papillitis of cerebral tumour or meningitis. Atrophy follows it in the course of a few weeks, while a human papillitis may remain in the œdematous stage for months before atrophy occurs. Nay, more, how does it come about that, though cerebral tumour can hardly be considered a disease of so infective a tendency as meningitis, optic neuritis is so frequent, almost a constant feature of the former, while so much rarer in the latter, and so very unusual (*une véritable rareté*) in abscess of the brain. [This point seems to us to be expressed more strongly than clinical facts quite warrant.] An abscess, it is true, may be encysted, but even when it is so, absorption may be so active as to give rise to evening rise of temperature, and yet not to any neuritis. Another question crops up here, viz., the difference between true tumours and inflammatory new growths. A sarcoma of the choroid causes no inflammation of the iris, ciliary body or other portion of the eye until the glaucomatous stage is reached, while a gumma or tubercle produces iritis, opacity of the media, circumcorneal injection, &c. Microscopic examina-

tion in such cases bears out clinical experience entirely ; in the one we have to do with a localised growth in a healthy eye, in the other there is cellular reaction even at considerable distances from the focus of disease—infiltration of the tissues by cells of special character.

These facts seem to establish that the occurrence of the optic neuritis can hardly be a consequence of the tendency of a bacterial disease (meningitis) to set up inflammation both in its immediate surroundings and at a distance, for then papillitis would not be so (comparatively) rare in meningitis and abscess, and so very frequent in true tumour of the brain, a disease not bacterial, and which has not this power of distant infection. It is also a matter of surprise that an infective agent should select the optic nerve and pass over other nerves which we should suppose were equally in danger of affection.

An argument of a totally different order, an argument against the infection theory, not speculative but experimental, is furnished by the complete cures which have been obtained of the papillitis in cases both of tumour proper and of gumma, by trephining, accompanied or not by the use of other remedies. These cures have been obtained, it is to be remarked, by drainage of the cerebrospinal fluid, by simple opening of the skull, &c., and are not dependent on removal of the tumour at all. Probably even in a case of tubercular meningitis, then, the course of the papillitis would be favourably influenced by trephining.

There is no question that there is an important distinction to be made between those forms of papillary œdema which for a long period leave vision intact, and are liable to pass off without leaving any trace under treatment essentially mechanical (trephining, &c.), and those cases, on the other hand, of neuritis and papillitis, which are inflammatory in origin, and which rarely can be cured without leaving some degree of atrophy, they being accompanied by visual symptoms from the very first.

One can hardly believe in the infective character of a papillary alteration which is cured by a simple opening

into the cranial cavity. Deutschmann has, it is true, produced something more or less analogous to a papillitis by the injection of tuberculous pus into the cranium, but he has not proved that this was the direct result of the injection. He has produced in the rabbit a tubercular meningitis which has been followed by papillary alterations, but in the explanation of how this sequence has occurred the author and certain other writers differ from Deutschmann. He does not seek to deny that these infectious injections could have an evil influence on the papilla if they passed along the subarachnoid space; it is possible that in some of the cases infection was added to œdema. But this œdema, which can persist for long and yet leave function intact, is the essential thing, and Deutschmann's theory fails to explain it. Parinaud, who has devoted much attention to this point, believes, from his experience of numerous autopsies of children affected with tubercular meningitis, that the papillary œdema is not related directly to the tumour or meningitis, but to the accompanying hydrophy of the ventricles and of subarachnoid space at the base of the brain. A tumour which does not cause this condition does not cause papillitis. The manner in which the ventricular and subarachnoid dropsy explained by Schultz produces papillitis, probably is by the fluid passing first by Majendie's and Luschka's apertures from the ventricles to the subarachnoid space, to some extent also "water-logging" the cerebral substance; thence it easily passes along the optic nerve sheath, and so through the lamina cribrosa to the disc. So say Schmidt and Manz. The absence, however, of subarachnoid œdema in some cases of cerebral tumour with optic neuritis, and the occurrence of papillitis in certain orbital cases (tumours, cysts), make this explanation of doubtful value. Parinaud regards the cerebral œdema as the essential link between optic neuritis and cerebral tumour; the distension of the ventricles causes a difficulty in the lymphatic circulation with œdema, in consequence of brain and therefore of optic nerve and disc.

In regard to the explanation of why actual inflammatory

changes arrive, Leber has recourse to the idea of a general infection; Deutschmann to that of a microbic infection, but Parinaud points out that many œdemas mechanical in origin in other parts of the body become inflammatory in the end, with atrophic changes in the tissue involved. The author sees, in this condition of a stagnation of fluids in the tissues, causing chronic inflammatory troubles, an analogy with glaucoma. The relief obtained (by de Wecker, Carter, and others) by operation, at least does not negative this supposition, as contrasted with those of Leber and Deutschmann.

W. G. SYM.

DEUTSCHMANN (Hamburg). On a New Treatment for Detachment of the Retina. (*Beiträge zur Augenheilkunde*, April, 1895.) *Centralblatt für Augenheilkunde*, June and July, 1895.

Deutschmann introduces the subject by discussing the state of opinion at the present day with reference to the origin of this disease, against which he considers medical treatment to be of no avail. He has long been seeking for some method of attacking the malady which will hold out some prospect of success, and for the last five years has employed that which he describes in this paper. His course of procedure is two-fold.

I.—Division or Laceration of Retina and Vitreous Humour. This step is taken because it is of primary importance that all strands of adhesion between the retina and the shrinking vitreous must be thoroughly divided, and facility given for the retina to return to its normal position. The pupil being thoroughly dilated, the conjunctiva is drawn aside, and under cocain a pointed, double-edged, very sharp knife is pushed obliquely through sclerotic choroid and retina into the vitreous humour in the direction of the detached portion of the retina. The knife is to be carried on until the point impinges on the coats of the eye opposite the point of

entrance; as it is gradually withdrawn again, cautious cutting movements are to be made in the directions of the two edges alternately.

The design of the operation is (1) to evacuate the sub-retinal fluid; (2) to divide the retina at least twice in two different situations; (3) to cut across any strands in the vitreous humour which tend to drag upon the retina; (4) to permit the escape of the fluid which lies between retina and shrinking vitreous; (5) by these means to allow the pressure of the escaping pre-retinal fluid to cause close application of the now free retina to the choroid. This will be all the easier from the incisions in the retina; it is hoped, too, that the hæmorrhage will help to glue choroid and retina together. The bandage employed subsequently must be very loosely applied, lest distortion of the cornea should occur, the eye being very soft; when it is changed after twenty-four hours, the eye should be found free of irritation, though with perhaps a little chemosis. Atropin must be used for at least four weeks to prevent any action of the ciliary muscle. For eight days the patient lies still on his back; after that he has more freedom, but is strictly forbidden to bend down at all. If after four or five days there is no alteration of the position of the retina, the operation is repeated, even four times or more, as the author believes that a repeated laceration is a valuable factor in the cure. He gives reports of eleven cases thus treated, as a rule without any further treatment; in a few he also employed subconjunctival injection of corrosive sublimate in the hope of exciting some inflammatory reaction in the choroid and so of hastening the union of choroid and retina; he did not find this to be any additional advantage. In four cases he employed perforation of the coats of the eye with Paquelin's cautery; in one of them this was carried out in several places with a very narrow-bladed cautery; but he came to the conclusion that there was nothing gained by thus complicating the operation. Most of the cases were of myopia of moderate degree, in which there was no actual cause known for the detachment so common in the bad forms of myopia; only

in one case was the onset very abrupt. The detached retina could always be seen floating more or less freely in the shrunken vitreous humour; the tension was normal. The results obtained by this method of treatment must be regarded as remarkably favourable. We have space only for the most important particulars of one or two of the cases.

CASE I.—Male, age 38. V. = $\frac{1.5}{200}$ (—2D.). Field restricted to upper inner side; operation seven weeks after occurrence of detachment. Two days later the field was normal even in reduced light; with the ophthalmoscope the retina was seen lying flat; no vitreous opacities; the eye free from irritation. After four years V. = $\frac{1.7}{50}$ — $\frac{1.7}{40}$, J. 1. Field good.

CASE II.—Woman, age 30. V. = fingers at five or six feet. Upper half of field lost. Five days after perforation by Paquelin's cautery and laceration of vitreous and retina, field good and V. = $\frac{1.7}{200}$ and No. 10 Jaeger.

CASE III.—Woman, age 61. Old-standing detachment, V. = hand movements; after operation = fingers 4 or 5 feet; the condition recurred in four weeks.

CASE IV.—Man, age 42, four weeks' duration. V. (—5D.) = fingers at 15 feet. Field lost above. Paquelin operation; three weeks after which V. = $\frac{1.5}{100}$ — $\frac{1.5}{70}$ with a good field even in feeble illumination. Recurrence one month later, with V. = fingers at 13 feet. Laceration of retina and vitreous performed, with improvement to $\frac{1.5}{70}$; but after three months the detachment returned.

CASE X.—Woman, age 30. In right eye nearly complete detachment of old standing, with incipient cataract. V. = fingers at 5 feet excentrically. In left eye old-standing detachment below, with loss of field above and V. (—7D.) = $\frac{1.7}{200}$ J. 5. The laceration operation was performed in all, eight times in the left eye with resulting vision of $\frac{1.7}{40}$, J. 1, and a good field of vision even in reduced light. The operation was also performed twice in the right eye with a result of V. = fingers at 12 feet and a good field in bright daylight. The ophthalmoscopic appearances were highly satisfactory.

II.—Transplantation of the vitreous humour from the eye of the rabbit has been adopted in certain cases, Deutschmann being induced to do this by the early improvement followed by later recurrence in some of his cases treated by the first method. The objects aimed at are briefly these: To deposit in the vitreous chamber a substance which is transparent, aseptic, and not an irritant to the retina or choroid, but yet which will press the retina back into its normal situation where it may be retained permanently by mild inflammatory reaction. The operation is performed in the following manner: the eye with the pupil fully dilated is cocainised; two young rabbits are in readiness; these should not be more than nine months old, because the chemical reaction of the tissues of older animals is more intense than that of younger. After careful disinfection, an eye of one of these animals is enucleated, and having been well cleaned, is opened at the posterior pole; as the vitreous escapes it is to be collected in a shallow glass vessel (which having been previously disinfected by heat, has been allowed to cool down to 40° C.) and covered up. Enough of a solution (disinfected by heat) of common salt (.5 or .75 per cent.) is added to dilute the vitreous to a fluidity suitable for use in a syringe. This is to be injected along a needle introduced obliquely into the patient's eye just behind the ora serrata, and pushed in till the injected fluid may be deposited in the immediate neighbourhood of the detached portion of the retina. Immediately then the fluid behind the retina is to be drawn off by a puncture in the coats at the situation of greatest detachment, and the laceration operation performed. Through the Pravaz (so-called) syringe—which should have a glass barrel and asbestos piston, and which is to be at a temperature of 38° C.—the diluted vitreous humour is to be injected very slowly until the tension of the globe is *medium*; it ought not to become “hard,” or harm will result. The needle is, after a short interval, withdrawn slowly; if this is done carefully none of the fluid will escape. A light bandage, changed twice every twenty-four hours, is applied for three or four days. Usually about the second or

third day inflammatory reaction of the whole uveal tract sets in, lasting acutely for two days; there is severe pain in the eye and round it, chemosis, swelling of lids, irregularity of the pupil, posterior synechiæ, exudation in the pupillary area, sometimes actually mixed with blood. Under treatment with atropin these symptoms pass off in a few days. Immediately after the injection the vitreous is clear and transparent, but becomes in a few hours entirely or partially opaque, with yellowish gray masses lying against the retina as in acute abscess of the vitreous. Very gradually these are absorbed and disappear, leaving the vitreous clear again, and the tension, low at first, rises again to normal.

The severity of the inflammatory reaction depends upon the concentration of the material injected, and the number of repetitions of the operation. The most suitable diluent of vitreous humour appears to be salt solution of 0·5 or 0·75 per cent.; the more dilute it is the less the reaction, but the less permanent is the result; the eye will bear on the second occasion a more concentrated injection than on the first. As to both quantity and quality, it is better to do too little than to attempt too much. It is necessary to have all vitreous bands thoroughly divided as a preliminary to the injection.

The object of the injection is not simply to obtain a temporary filling up of the eye with fluid; it must be permanent, and there must be produced by the necessary reaction an inflammatory adhesion of choroid and retina. On both these grounds the rabbit's vitreous humour seems to be particularly suitable; it is not too rapidly absorbed, and keeps the tension up, sometimes it even rises a little above normal, while the inflammatory reaction is sufficiently severe to ensure adhesion of the membranes without being so violent as to be destructive.

Deutschmann recounts six cases (seven eyes) in which he has carried out this plan of treatments; we give very brief notes of them.

CASE I.—Man aged 28. V. = $\frac{3}{4}$, left eye; J. 3 with difficulty. Laceration operation performed three times;

improvement at first, but after a fortnight $V. = 0$. Injection operation then performed. On evening of the day of operation P. l. and good projection; after one day, fingers were counted close to the eye; after four days, fingers counted at three feet, and a good field of vision; after twelve weeks $\frac{17}{200}$; after five months $\frac{17}{70}$, J. 3 with a good field even in diminished light. The right eye, similarly treated, improved from fingers at 14 feet to $\frac{17}{200}$.

CASE II.—Man aged 42. Vision = fingers at 4 feet excentrically. Five months after one injection = fingers at 6 to 7 feet; ophthalmoscopically the retina was seen to be adherent to the choroid.

CASE III.—Man, aged 68; complete detachment. $V. =$ hand movements. Each operation was performed twice. Result = fingers at 2 to 3 feet.

CASE IV.—Uncompleted as yet.

CASE V.—Man, aged 32. Recurrent detachment. $V. =$ hand movements doubtfully. One injection. After five months, $V. = \frac{17}{200}$.

CASE VI.—Woman, aged 58. Very myopic. $V. =$ hand movements to upper outer side; three laceration and three injection operations. After four months $V. = \frac{3}{50}$.

[The cases are too few as yet for us to be able to come to any very definite conclusion as to the probable value of this mode of treatment, and one must bear in mind in reading the above accounts of cases the well known rule, that any given method of treatment succeeds better in the hands of its introducer than in those of any one else. We cannot help doubting whether such very free laceration of vitreous and retina is necessary previous to an injection; one has to sacrifice a great deal in doing this in deference to the theory that there are always vitreous bands present which cause detachment of the retina by their contraction. It is doubtful whether this is an invariable rule, especially in the myopic cases, and even where such free laceration of the vitreous humour is thought desirable, the retina might perhaps be spared some of the slashing.]

W. G. SYM.

OPTOMETRY BY THE SUBJECTIVE METHOD.¹

BY DR. GEORGE J. BULL, PARIS.

IN the present state of ophthalmological science it is obviously impossible to dispense with the subjective methods of optometry.

Every experienced practitioner, however, will be aware that the exactitude of these methods is impaired by many serious sources of error. The object of the present paper is to direct attention to certain considerations by which some of the most important of these dangers may be largely eliminated.

Subjective optometry is, by the nature of the case, to be divided in practice into the diagnosis of ametropia in general, and the specific diagnosis of astigmatism.

The considerations to which I would direct attention have relation to the relative priority of these parts of the examination. If the patient be first examined by general tests for the purpose of determining the degree of myopia or hypermetropia, as the case may be, while the possible presence or degree of his astigmatism is undetermined, the conclusions to be drawn from his answers will, according to my experience, be liable to very large elements of error.

It is a commonplace of ophthalmological practice that it is much more difficult to determine correctly mixed or hyperopic astigmatism than it is to determine the exact

¹ Read at the Annual Meeting of the British Medical Association, held in London, July, 1895.

correction of myopic astigmatism. This difficulty led me, for my own guidance, to state the problem presented in our practice in the following form :

The presence of astigmatism manifestly affects the range of accommodation towards the remote point and also towards the near point, but leaves it practically unaffected in the intervening space. Let us say, therefore, that the range in the case of the astigmatic patient may be divided into three zones. Supposing, for the sake of clearness, that we assume a full range of 4D. of accommodation in an eye of which the horizontal meridian is emmetropic, while the vertical meridian has 1D. of myopia. The result of this 1D. of astigmatism is to resolve the range into what I venture to call a *remote zone* of 1D. in extent, within which the patient can accommodate for vertical lines, and not for horizontal lines ; a *mean zone* of 3D. in extent, in which he can accommodate for either ; and a *near zone* of 1D. in extent, in which he can accommodate for horizontal lines and not for vertical ones, as is indicated in Diagram 1.

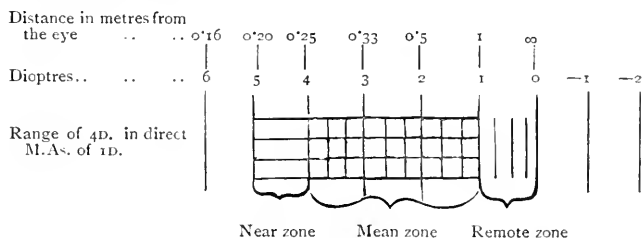


DIAGRAM 1.

If an object containing both horizontal and vertical lines is exhibited to this patient anywhere in the mean zone, he will be able to see it with a degree of distinctness practically sufficient for ordinary purposes, because although at any one instant the vertical lines may be to him different from the horizontal, he can in practice focus first for the one and then for the other by an alternating arrangement of extreme rapidity, of which

he is probably altogether unconscious, and which, in the processes of ordinary life, has become perfectly habitual to him. This, at least, appears to me to be the correct account of his method of vision. My present point, however, is that, if he were asked to look at the clock lines either with the naked eye at a distance which was in fact in the mean zone of his range, or with any spherical glasses which would produce an equivalent result, he would probably declare, even if he were a very accurate observer, that he saw no difference in the distinctness of vertical and horizontal lines. If, however, the same object were presented to him anywhere in his remote zone, he would be able to focus for the vertical lines, and would consequently declare that he saw them with distinctness; but he would be wholly unable to focus for the horizontal lines, and would consequently be obliged to report that he saw them blurred.

This appears to me to afford us a simple and logical formula by which certain important possibilities of error in the subjective method may be avoided. That formula is that *astigmatism should in practice be examined only in the remote zone*.¹

Having stated the principle, it may be convenient that I should now restate the problem as it appears under the ordinary conditions of the consulting-room. It will be apparent from what I have said that it will in many cases make a very important difference whether the examination for general ametropia is or is not carried forward to its apparent conclusion, before the observer has determined the extent to which astigmatism may be present. I can best illustrate this by a concrete case.

If, for example, we suppose a patient with a general myopia of 2D., who has at the same time a direct myopic astigmatism of 1D., the existence of which is as yet

¹ It is obvious that the examination might be applied in the *near zone*, but in practice this is never desirable.

unknown to the observer, what may happen is obvious. If the observer begins by endeavouring to determine the degree of general myopia, by following the common rule of giving the weakest concave spherical glass which most improves the visibility of distant test-types, he will find that the patient sees best with $-2\cdot5$ or -3 , and the patient will certainly prefer -3 to -2 . The fact is that in the given case the use of the -3 glass will cause the astigmatism to be almost entirely masked, because at that point the patient can probably accommodate without any conscious difficulty for any or all of the lines of the clock, as will be evident by the second of the scales in the appended Diagram 2. The clock is now in effect in his mean zone. If, therefore, the patient is not asked to look at the clock dial until the general ametropia has been, as it is supposed, completely corrected, the probability is that the astigmatic patient will not observe any difference in the lines, and that his answers, however subjectively accurate, will be in fact misleading.

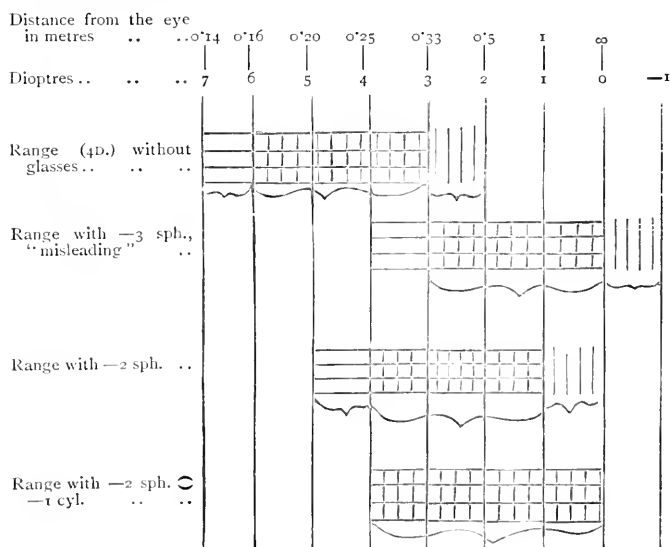


DIAGRAM 2.

If, on the contrary, the presence of astigmatism had been first of all determined, the source of error in question could be eliminated without difficulty. Leaving objective methods out of consideration for the present purpose, it is quite possible to arrive, by a careful use of subjective optometry alone, at a very accurate result by the simple process of referring the patient to the clock-dial at an early stage of the examination, when his vision is in the condition of what I may call the *appropriate myopia*.

In the case supposed, the condition is arrived at by the very simple expedient of referring him to the clock-dial as soon as the observer has found the weakest spherical glass with which any one of the radii can be distinctly seen. As a matter of precaution, the process might be commenced with an even weaker glass, but all that is essential is that the trial of concave spherical glasses shall not be pressed beyond the point I have described.

In the case above supposed, the glass in question will be —2. Leaving this glass in the trial frame, let the patient now be given concave cylindrical glasses with their axes at right angles to the line which is distinctly seen until the transverse lines are seen with equal clearness. The weakest cylindrical glass which equalises the lines represents the value of the astigmatism, and the possibility of the error referred to has been eliminated.

Those who have done me the honour to follow the earlier portion of this paper will not need to be told that what we have done in effect is to exhibit the clock-dial under such circumstances that it is in effect at or near the remoter limit of the remote zone, as will be seen by the third of the scales in Diagram 2 above. My own practice is always to transfer the patient's range of accommodation to such a point as will bring my clock-dial to a position a little beyond the *punctum remotum* of his meridian of least refraction.

In hyperopic, or mixed cases, the same principle of reduction in the first place to the appropriate myopia can be applied with equal exactitude. Suppose for example, a patient has an unsuspected direct astigmatism of 1D., with a general hypermetropia of 2D. The process would then be to bring his range of vision back by convex spherical glasses, without regard to the clearness of the letters, as long as any of the lines in the clock-dial remain clearly visible. In the case supposed, he would then have in the trial frame a convex spherical glass of about 3D. For the purpose of our diagnosis he is then in precisely the same condition as the last case, and it is only necessary to give him concave cylindrical glasses in the transverse axis until the lines are equalised. The clock is, in fact, again brought to somewhere about the remoter limit of the remote zone, the whole range having been first transferred so as to imitate the simple case of myopic astigmatism. This condition and its correction in the manner suggested may be illustrated by the annexed Diagram 3.

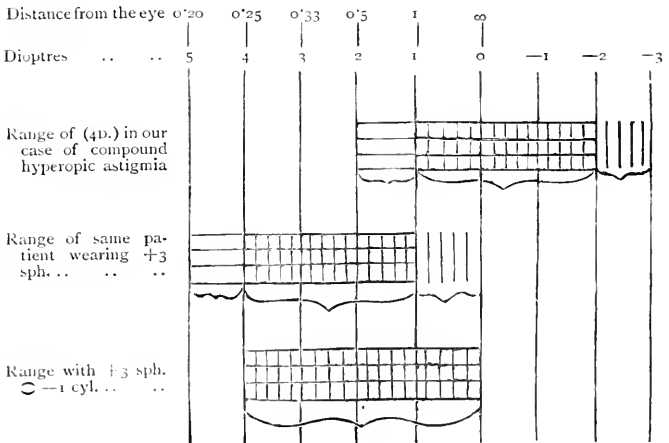


DIAGRAM 3.

The astigmatism being now reliably determined, the diagnosis of the general ametropia can be completed by the obvious process of leaving the cylindrical glasses *in situ*, and trying back with spherical glasses, according to the ordinary rule, until we have found the weakest concave or the strongest convex spherical glass with which the distant test-types are best seen.

It will be observed that, by the method proposed, the familiar difficulty of hyperopic astigmatism is removed by the simple expedient of converting the problem in each case into the myopic form. This, I suggest, is not only convenient in practice, but is also the logical and appropriate method of resolving correctly the problem which is presented to the practitioner. I suggest, therefore, that the conclusion arrived at may be easily and correctly set out in some such rule as this:—

“Before attempting to correct the general ametropia determine the meridian of least refraction, if any; make that meridian slightly myopic, and at once determine the astigmatism exactly by means of concave cylindrical glasses in the transverse axis; finally, with the cylindrical glass *in situ*, complete the correction of the general ametropia by adjusting the spherical glasses according to the common rule.”

It will be obvious to those who have followed the reasoning of my paper that this rule may be more briefly stated in the form: “Make all astigmatism myopic, and then measure it in the remote zone.”

It is an incidental but a useful corollary of this method that it obviates the harassing and unsatisfactory process of trying backwards and forwards with concave and convex cylindrical glasses under circumstances which make it almost certain that the patient's answers will become confused; and also that it dispenses entirely with the necessity of resorting to the use of mydriatics for the purposes of subjective optometry.

APPENDIX.

It may be appropriate to add here a somewhat fuller explanation of certain phenomena which characterise astigmatic vision in the outer zones. It is hardly necessary to observe that the diagrams printed with the text are by no means intended to indicate that the vertical or horizontal elements (as the case may be) disappear the moment the object is carried out of the mean zone. On the contrary, a distinct factor in the trouble and uncertainty of astigmatic vision is the persistence, at certain ranges, of blurred or doubled elements lying in one meridian in combination with fairly distinct elements in the transverse meridian. It would be approximately correct to say, if we take as the unit of visibility an object subtending an angle of five minutes at the retina, that each unit may be expected to continue to be more or less visible for a range of 2 or 3d. beyond the *punctum remotum*, and probably for a relative distance within the *punctum proximum*, although in the latter case it is, under ordinary circumstances, difficult to determine the vanishing point with accuracy because of the rapid increase in the apparent size of any given object.¹

The diagrammatic representation of the zones of vision in an astigmatic eye, such as that to which Diagram 1 refers, might, therefore, be more justly represented by some such scheme as the following :—

¹ The determination may, of course, be made if desired, by using a series of test objects decreasing proportionately in magnitude as each approaches the eye. I have constructed such an optometer for my own use, and have found it of some service.

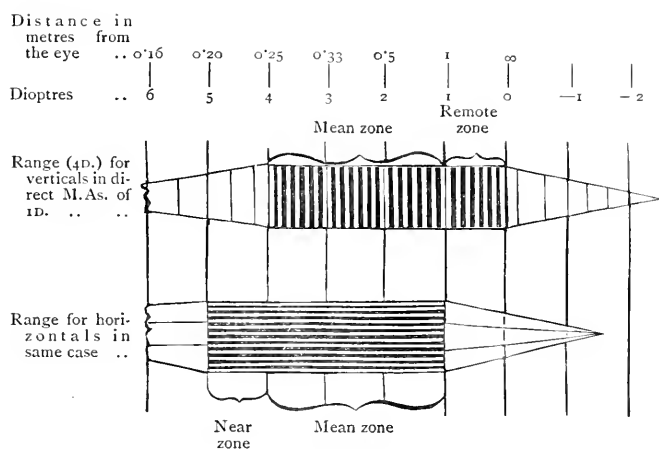


DIAGRAM 4.

Such a diagram may make it easier, for example, to realise how a cathedral or a tree would look to an artist having the given kind and degree of astigmatism. If the object were so placed as to be in his "remote zone," he would see the pillars of the architecture or the trunk of the tree correctly, but his vision of the transverse galleries or of the branches would be distorted and impaired. If it were so placed as to lie for him between ∞ and -1 , he would see both less clearly, but would still be able to make out something of the general effect. If it were a diopetre further off again, he would practically or wholly lose the horizontal elements, and would see a picture in which the verticals would predominate altogether, although they also would be very much blurred and very badly seen. He might still see a good deal of the main outlines of any scheme in which the vertical lines were the most essential characteristic.

It is important to observe that the vertical or horizontal elements (as the case may be) seem to undergo, as they pass away from the limit of their zone of accommodation, an optical process of dissipation or resolution as to which I have observed a number of interesting phenomena. It may be stated generally, in the first place, that as we

travel beyond the limit of the zone of accommodation, the apparent width of a limit line will be continuously increased, and its intensity continuously diminished, in a manner corresponding to the effect upon a pencil of light of a progressive spherical aberration. The process of dissipation, however, assumes various forms which may be broadly classified as follows :—

(a) The simplest form is that in which the elements seen by the meridian which is unable to focus the object perfectly, are distinguished only by loss of definiteness of outline, diminution of intensity and increase of apparent width.

(b) In another series of cases one edge of the line appears to remain relatively distinct, while the other edge is resolved into a penumbra.

(c) In a third series of cases which characterise that part of what I may call the cone of dissipation, which approaches the vanishing point, the weak line is only faintly recognised as a diffused band of shadow of relatively great width, often, for example, as much as quadruple the apparent size or more. If the observation be pressed in this stage by adding the appropriate glasses, the gradual dissipation of the shadow may be easily followed right up to the point of the cone.

(d) At certain points the process of dissipation takes the interesting specific form of a reduplication of the original line in the phenomenon commonly spoken of as “doubling.” It would be incorrect, however, to assume that this condition is in reality a mere doubling of the original line. It is probably more correct to describe the appearance as a resolution of the line, first into two comparatively narrow dark bands, with an intermediate band of white or grey, and in a further stage into three dark bands separated by two light ones. I have even found it possible in a limited number of cases to identify four or more of these dark resolution lines, but in these instances the intensity is already weakened to such a degree that the case is hardly to be distinguished from the condition of general diffused shadow described above under *c*.

The phenomenon of doubling is, of course, familiar in one form or another to all who have studied astigmatism. It may, however, be useful to observe that many persons in an astigmatic condition will describe their vision of any of the larger letters in the test types by saying that they see it as if there were several letters *superposed* in such a manner that the main image in the centre would be overlaid on the one side by one or more faint reduplications, and on another side by a similar series. Such a person (supposing the astigmatism to be direct) may, for example, in looking at the large C, observe a faint letter displaced upwards and another faint letter displaced downwards, and if he does he will probably notice that the area where these images coincide with the position of the actual letter in the centre, becomes prominent as a very black and striking portion of the figure seen.

One cause of the difficulty which an astigmatic patient experiences in seeing such a letter correctly is that the shape of this prominent portion of the field may be entirely different from the shape of the original letter. It would, however, be misleading to suggest that these appearances are specially characteristic of astigmatism, as distinguished from other errors of refraction, since the apparent partial superposition of multiple images may be observed in other forms of refractive error.

It is of considerable importance for practical as well as theoretic purposes that these phenomena should be accurately observed, and this is not always easy. I have found, for example, that astigmatic patients often find it difficult to answer definitely as to the relative values of the lines of the clock, apparently because of the somewhat puzzling changes through which the different meridians pass rapidly as the patient observes them through a consecutive series of lenses. This observation has led me for my own convenience to substitute for the clock face a simpler, but in my experience a more delicate and reliable instrument. This consists of a rotatory disc, carrying only two lines at right angles to each other, which I call *the cross*. I find that the patient, having only two lines

to compare, is able to observe slight doublings or shadows, or slight differences in the intensity and definition of these two lines much more accurately than he can observe the precise differences of value between the various lines of the clock. The way in which I am accustomed to work is to first determine roughly with the clock, using spherical lenses only, the general direction of the meridian of least refraction, and then to ascertain more closely by means of the cross the exact position in which this meridian lies.

At this point I direct the patient's attention to the line of the cross perceived by his meridian of least refraction, and correct that meridian carefully with a spherical lens. When this is accomplished it is comparatively easy to find the concave cylindrical glass by which the transverse line of the cross is made equally definite and intense.

CHOROIDAL SARCOMA IN INFANCY.¹

BY JOHN GRIFFITH, F.R.C.S.

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WE have, in the human eye, an organ which, in respect to sarcomatous growths, presents a striking parallel to similar morbid changes in the testis. In each we find a highly specialised structure enveloped in a strong inelastic fibrous tunic.

Sarcomata of the testis may appear, as Mr. Butlin has pointed out, at two different periods, viz., before the age of ten years, and again in middle life. Intraocular

¹ Read at the Annual Meeting of the British Medical Association, held in London, July, 1895.

sarcomata may similarly present themselves in infancy or in middle life. Between and after these times, we are much less liable to suffer, though we cannot, at any time, be considered safe from an invasion.

This subject, *i.e.*, sarcoma of the choroid in infancy, is of interest, not so much in its clinical aspect, as in its pathological. It will be seen that, clinically, it is almost impossible to decide whether a tumour is primarily choroidal or retinal, but this is not a point of much moment. The fact that sarcomata can be shown to originate in the choroid in the early years of life, is sufficiently startling to those whose belief is firmly rooted in the gliomatous nature of all infantile intra-ocular growths, and it becomes all the more so, when the structural relationship of these respective tumours is considered. It will be my endeavour in this paper to adduce evidence to show that many tumours, at present considered gliomata, are nevertheless, in all probability, sarcomata of the choroid.

Before attempting this somewhat intricate task, it may be well to relate the history and particulars of two remarkable cases, which, in my opinion, are examples of choroidal sarcoma occurring in infancy. By the term *infancy* I refer to the period of childhood preceding the fifth year of life.

These two cases were respectively under the care of Mr. Juler and Mr. Hartridge, and it is by their kind permission that I am able to use their clinical material for the foundation of this communication.

CASE I.—T. T., a French child, aged $2\frac{1}{2}$ years, was brought to Mr. Juler's clinic at St. Mary's Hospital in July, 1893. Her father had observed "a peculiar red light" in the right eye; it was noticed for the first time eight months previously. The child had never shown any signs of pain in the eye, but latterly she had been afraid of the light. The family history is good. There had been no previous illness, although she had been a delicate child. Within

the pupillary area, immediately behind the lens, an opaque yellow mass, with a brilliantly reflecting surface could be seen. The pupil was regularly dilated, and did not respond to direct or even to consensual light stimulus. Vision was apparently *nil*. The ocular conjunctiva was congested, tension was raised, and the eyeball seemed to be tender. The eye had never shown any signs of inflammation before the onset of this glaucomatous attack. The eye-ball was excised on July 14, 1893; the nerve was not enlarged, and to the naked eye appeared healthy.

In the following December it was noticed that a hard nodular mass was growing from the back of the orbit. A further operation was advised, but the parents would not allow the child to stay. I learnt subsequently from Dr. Floyer of Egham that the child died on July 1, 1894, *i.e.*, about one year after the excision of the eye. He said that "the tumour filled the orbit and grew outwards to the size of a small new potato; the left eye remained apparently healthy and free from disease. No autopsy was made."

The eyeball, hardened in Müller, was divided antero-posteriorly by a horizontal section. A slice-section was made and mounted. It shows a growth, non-pigmented, situated outside the optic disc, growing from the choroid, which, having perforated the melanotic epithelial membrane of the retina, has formed a more or less circumscribed spheroidal tumour in the subretinal space, this latter space being due to a complete detachment of the retina. The retina is not free from disease, but infiltrated with the growth which has disseminated itself into that membrane, as also into the subretinal effusion of lymph. This fluid, coagulated by the hardening agent, is seen to hold scattered cells suspended in clusters. The growth was examined microscopically and was seen to consist of round cells, uniformly distributed, without any structural intercellular tissue, and was not very vascular. The softness of the growth prevented good sections being made, and they were unfortunately discarded as worthless. The most interesting feature in them was the uniformity of the logwood staining.

CASE II.—The second case came under the care of Mr. Hartridge at Chatham. The left eye of a child, aged 4 years, was excised on November 23, 1893, for suspected glioma. Both eyes had been lost from ophthalmia neonatorum. Two years before the excision of the left eye, the right had been removed for pain by another medical man, but, unfortunately, no account of it can be obtained. The condition of the left eye at the time of enucleation was as follows: cornea opaque, numerous ciliary staphylomata, ocular conjunctiva dark red in colour, gelatinous in appearance, and very much thickened in places as if from a subconjunctival growth. The eye was very painful. The globe and ocular conjunctiva were excised together; in attempting to divide the nerve the posterior pole of the eyeball and attached nerve were left behind, but on removing the globe, which did not collapse, the small remaining portion was excised together with the adjacent portion of the nerve.

The eyeball, on section, presented a peculiar appearance. The preparation shows the cavity of the globe to be completely filled with a reddish-grey neoplasm. The lens, the only visibly healthy structure within the sclera, is entirely surrounded by it. The cornea is detached, as it were, from the sclera by the extension of the growth outwards through the ciliary region into the subconjunctival tissue. The extra-ocular portion of the growth is in hue paler than that within. Under the microscope sections of the growth are seen to be composed of a mass of large round cells with a granular intercellular cement substance, and in the front part, anterior to the lens, an alveolar arrangement of fully developed fibrous tissue is seen in which collections of these round cells are imprisoned. The extra-ocular portion does not show this alveolar formation. The cells penetrate into the substance of the cornea. In one part, blood pigment granules are seen which are probably hæmatoidin; very little true pigment is present, and that only in the neighbourhood of the destroyed iris. The vessels are neither numerous nor large, but their walls are

thin, such, in short, as are peculiar to sarcomatous growths.

These cases illustrate mistaken diagnoses so far as the seat of the tumour is concerned, but this is clearly of no consequence, for, clinically, their course and termination are such as occur in most cases of infantile intraocular tumours, whether they be retinal or choroidal.

Since the distinction between them is so difficult, it would be consistent with the title of this paper to enter briefly into the pathology of "glioma of the retina." I have, however, no wish to raise a contention as to the origin of these retinal growths or even to enter deeply into their pathology—for time will not permit—yet a moment's attention to it will facilitate the subject. The only point of difference, in my opinion, between them and sarcomata of the choroid is the seat of origin of the tumour; for the nature of the two growths, I consider, is identical.

With all due deference to Messrs. Panas, Knapp, Collins and others, I still firmly believe and agree with Professor A. Becker,¹ that a "glioma" is nothing more or less than a small round-celled angeio-sarcoma of the retina starting in the sustentacular framework of that membrane, and, strictly speaking, it is no more an ectodermal tumour than it is a true glioma.

If the latter term is to be retained at all it must form a compound word glio-sarcoma. But I do not consider this either necessary or right. If a sarcoma happened to originate in the vicinity of a tactile corpuscle at the end of a finger, it would not receive this name; should then a similar tumour starting in the neighbourhood of the rods and cones receive any such appellation? The term, I presume, has simply been retained in courtesy to its originator, yet Professor Virchow would not

¹ *Archives für Ophth.*, xxxix., 3, p. 280.

himself consider it a benign growth, nor place it in the same category as glioma of the brain. Nor does the naked-eye appearance suggest the term. The name of *medullary sarcoma* given to this tumour by Abernethy in the year 1804 was much nearer the mark than any hitherto applied to it, both macroscopically and microscopically; the only omission made by him was in localising its origin, and even now we are, in many cases, perplexed as to this point.

This intraocular growth is open to comparison with the allied tumour which may occur in the encephalon. Glioma of the brain is divided into two varieties: the firm, benign, encapsuled tumour of slow growth, the cells of which have as their prototype the fully developed neuroglia cell; this constitutes the glioma proper; and a malignant form which is soft, infiltrating, liable to hæmorrhages and mucoid degeneration, the cells of which are neuroglia cells in their primitive or embryonic stage—the glio-sarcoma. With the former there can be no comparison, but with the latter, which bears the same malignant properties, we may compare the ocular tumour.

To the naked eye glio-sarcoma of the brain and "glioma" of the retina are entirely dissimilar, and even by the aid of the microscope they are distinguishable, so that the term glio-sarcoma cannot possibly be appropriate to the two. The translucent, glue-like nature of the former, liable, as it is, to myxomatous changes, is quite distinct from the opaque, greyish-white retinal growth which may show caseation or calcification but not mucoid degeneration. Both are soft and permeated by thin-walled blood-vessels which may rupture and give rise to extravasation of blood; they are also clinically distinct. The intra-ocular tumour is invariably seen in infant life, whereas the intra-cranial or intra-neural growth not infrequently occurs in adults. The peculiar manner in which the retinal tumours are seen

to take the staining when histologically examined, is probably owing to a physical cause, viz., the result of the intraocular pressure upon the transudation of lymph from the vessels into the interstices of the neoplasm, for this peculiarity is not seen in the growth when it has become extra-ocular. Thus only the cells in the vicinity of the vessels obtain nourishment, those further remote dying after fatty changes or undergoing a coagulative necrosis.

Returning to the ectodermal theory mentioned in the lectures delivered by Mr. Treacher Collins¹ at the Royal College of Surgeons, 1894, we find in them the following paragraph in brackets "(Mr. Collins then pointed out that there were great clinical, histological and embryological differences between gliomata and sarcomata, and suggested that as a sarcoma represents the fœtal condition of the tissue in which it primarily grows, so glioma of the retina represents the fœtal condition of the retina)". These great differences of which Mr. Collins speaks having unfortunately not been mentioned in the *Lancet*, the lectures presumably are not recorded *verbatim*.

The clinical and histological features of the infantile choroidal growth—a sarcoma—may be aptly compared with the retinal growth—a "glioma." Who can deny the resemblance? The clinical course and histological appearances of the two practically coincide. The embryological side of the question may be thus contested. Such tissues are invariably composed of masses of round or polygonal cells in a process of histogenetic differentiation, and it is impossible to tell, at that period, whether a cell is mesoblastic, epiblastic or hypoblastic except by the conformation of the cell masses. Now we know that prior to birth, bloodvessels insinuate them-

¹ E. Treacher Collins, *Lancet*, vol. ii., p. 1337, "Lectures on the Anatomy and Pathology of the Eye."

selves in the cellular retinal membrane, and we know that together with them mesoblastic cells or embryonic connective tissue cells enter to the eventual formation of the supporting tissue of the neuro-epithelial elements. These mesoblastic and epiblastic cell-elements are indistinguishable, and so, I take it, the embryological distinctions of tumours, the cells of which partake of the same character, are not so great as they have been said to be. A pathological fact, forming a still stronger argument against this ectodermal theory, is the entire absence of a parallel example. Malignant growths, originating in tissues of epiblastic origin, are quite unknown in the period of early childhood. They are, invariably, mesoblastic. It is quite evident, therefore, that this theory does not harmonise with general pathology.

Professor Knapp points out that, in cases of retinal gliomata, the choroid undergoes atrophy, that the cells of the growth exert no spermatic influence on the cells of the choroid, and he offers this as a point in evidence against glioma being a sarcoma. The progression of malignant tumours by the spermatic influence of diseased cells upon healthy cells is an assumption, and not a proven fact, hence, no great stress need be laid upon this point even if it were possible to prove that it constituted a difference in their development.

Should my view prove to be the correct one, that is, if all intraocular neoplasms occurring in the infant period of life are sarcomata whether their seat of origin be in the retina or in the choroid, it explains the difficulty of determining points of distinction between them. They are both soft round-celled growths; their rapidly infiltrating nature, their power of recurrence and dissemination, and their frequently fatal course, place them in the foremost rank of malignant tumours. They are both white growths, *i.e.*, tumours devoid of true pigment. This is a point worthy of especial attention, because we should expect choroidal growths to be pig-

mented as is seen in those of adult life, leucosarcomata being relatively rare. But I can find no instance of a melanotic sarcoma occurring before the age of twelve years, whereas, I believe, no instance of so-called "glioma" of the retina is known after that age. Upon what does this fundamental difference depend? Is it dependent upon the seat of origin, or the nature of the tissue in which it starts? If the choroid of a newborn child be examined with the naked eye it is seen to be devoid of pigment. I am aware that Collins has informed us that pigment is first seen in the connective tissue corpuscles of the choroid at the seventh month of foetal life; the eyes of a still-born child at full term, kindly obtained for me by Mr. Corfe, the resident obstetric officer at St. Mary's Hospital, however, did not show any pigment in the choroid but only in the retinal epithelium. This is merely the evidence of one case, yet it shows that the choroid is not always pigmented at the ninth month of foetal life; besides, the usual absence of stromal pigment in the iris of the newly born, argues in favour of the absence of pigment in the cells of the choroid in infancy. From non-pigmented tissues pigmented tumours cannot arise, and so a white growth is not necessarily retinal.

These choroidal tumours are almost invariably soft round-celled sarcomata, just as are those of the testis in early childhood; their malignancy, much greater than the firmer spindle-celled sarcomata, would manifest itself in their early penetration of the lamina vitrea, and in the luxuriance of their growth in the softer retinal tissue by infiltration and dissemination, so that the original foetal lesion may be quite insignificant in size compared with the secondary growth in the retina. Similar nodular deposits in the retina are occasionally seen secondary to choroidal sarcomata of adult life.

Mr. Nettleship¹ has reported a case of leucosarcoma

¹ *Ophthalmic Hospital Reports*, viii., p. 264.

of the choroid in a girl aged 12 years, in which secondary nodules were seen in the retina. The primary growth showed no degenerative changes. Professor Hirschberg¹ also records a similar case.

Dr. Hill Griffith has kindly informed me, upon enquiry, that he had seen between fifty and sixty cases of glioma, and that he had plenty of evidence, both naked eye and microscopic, that the choroid had been free from invasion, and when affected, the invasion has occurred so late as, at any rate, to be secondary to the retina; the part affected has, moreover, always been the posterior portion near the optic nerve. "I have," he says, "frequently examined sections of early date, in which the retina, both posterior and anterior to the growth, has been normal." Besides such evidence as this, we have the cases of "glioma endophyton" of Hirschberg,² in which the retina alone was involved. These, I take it, are sarcomata of the retina. Unfortunately the paucity of literature on the subject of choroidal sarcomata in infancy does not much assist in establishing it, but Professor Panas³ has, in his valuable treatise, collected the reported cases of this disease. He does not, however, consider that the one published by Papillian⁴ and those by Lagrange⁵ are really cases of choroidal sarcoma.

The two I have ventured to bring forward are, I believe, sarcomata of the tunica vasculosa, the first originating in the choroid, the latter probably so, though it may have begun in the ciliary body or in the iris. I have already given my reasons for this belief.

In conclusion, the following may be mentioned as points of difference between retinal and choroidal sarco-

¹ *Arch. für Ophth.*, t. xvi., p. 302.

² *Annales d'Oculistique*, t. li., p. 76, 1869.

³ *Traité des Maladies des Yeux*, Paris, 1894.

⁴ *Thèse pour le Doctorat en Médecine*, Paris, 1883.

⁵ *Archives d'Ophthalmologie*, 1892.

mata:—Retinal growths are invariably composed of small round cells, are liable to secondary degenerations, and show irregular staining of the cells; whereas those of the choroid are constructed of round cells of a larger size, are less prone to secondary changes, and have a tendency to rapidly infiltrate all the intraocular tissues.

Every surgeon fashions his views on the statistics of his own personal observations. Younger men are unable to do so, and must be content, at first, to base their knowledge and opinions on the statistics of others. The conclusions I have arrived at, therefore, from the few cases I have seen of infantile intraocular tumours, are not *per se* of great value, but they help to substantiate the opinions of other observers with regard to the occurrence of choroidal sarcoma in infancy. The subject is one of much interest to myself, and has, I trust, an importance of its own, sufficient to warrant this expression of my opinion on the pathology of so-called "glioma of the retina."

THE RADICAL OPERATIVE TREATMENT OF TRICHIASIS.¹

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THE following method of treating trichiasis is the outcome of my experience in Egypt, where this condition is found in quite one quarter of those cases afflicted with eye disease which require operative interference during treatment.

For the sake of brevity, I wish for the moment to include under the term "trichiasis," all those cases in

¹ Read at the Annual Meeting of the British Medical Association, held in London, July 1895.

which, from whatever cause, except spasm, the eyelashes sweep against the front of the eyeball as in trichiasis and distichiasis, either total or partial, also in entropion, and these whether occurring in the upper or lower eyelid, because the following operation is equally applicable to all of them, and nearly always ensures perfect results.

Originally when these cases presented themselves for treatment, I naturally employed those operations which are commonly found described in text-books and elsewhere, but was most dissatisfied with the results, owing either to recurrence of the malady, or to the after-deformity produced in the eyelid, the latter consisting of visible and unseemly cicatrices, or even amounting to actual distortion.

The method of operation which I at present employ and now describe, I have, for want of a better word to express its nature, termed "tarsal re-position." The process of perfecting it has been very gradual, and it was not until a great many cases had been operated on, and the defects appearing in each successive series had been rectified, that, finally having performed it on a large number of cases with almost invariable success, I have felt justified in trying to make the matter generally known.

The instruments requisite for operation are the following: (1) A scalpel, or a Beer's cataract knife, with a well rounded off and sharp cutting point. (2) An ordinary "Entropion Spatula," which is more convenient to use if a narrow square metal ridge is added across the back, enabling the operator to hold it in position, when necessary, with the fifth finger of the left hand. (3) A pair of strong double-bladed fixation forceps, closed by a sliding catch. (4) Needle-holding forceps, two small double-eyed curved needles for wire, and very fine silver wire thoroughly softened before use by being passed through the flame of a spirit lamp.

The operation may be described as follows:—The eyebrow and both surfaces of the eyelids having been thoroughly cleansed, the spatula is passed into the conjunctival fornix, under the upper eyelid, which is then everted; an incision is made on this conjunctival surface of eyelid, parallel to, and at a distance of about 2mm. from the margin; it must divide the tarsus completely in its whole thickness, and from end to end. Any bleeding which occurs is easily arrested by pressure. The eyelid is replaced in position, and its divided margin grasped between the blades of the forceps; the catch is closed, and the handle of the forceps then carried upwards, so as to rest against the eyebrow, and thus forcibly evert the separated portion of tarsus which carries the eyelashes. One needle armed with silver wire, about 18 inches (45cm.) long, is sufficient for each eyelid; it is passed vertically downwards, through the skin-surface of the centre of the lid into the substance of the upper portion of tarsus and emerging in the middle of its divided edge then enters the original anterior surface of the lower separated and everted portion of tarsus, to be finally brought out on the free margin of the eyelid, midway between the eyelashes and conjunctival edge. Two other sutures are similarly introduced, one towards each end of the eyelid. The opposing ends of these three sutures, which should be left long, are now separately twisted together, not so tightly as to cause constriction but just firmly enough to retain the eyelid margin in its everted position. The forceps are removed. The remaining part of the suture is now passed along in the tissue of the eyebrow, from one extremity to the centre, at which points the corresponding twisted strands of wire are attached to it; the needle is re-introduced at the centre of the eyebrow, close to its point of emergence, and is brought out at the opposite end, where the third remaining twisted suture is secured to it. When the lower eyelid is the

site of operation, the tissue of the cheek is used as a fixation point, instead of the eyebrow.

Although this description is necessarily a somewhat lengthy one, the operation when performed only occupies about three and a-half to four minutes. I usually find that a requisite amount of anæsthesia can be produced by the simple instillation of cocaine in the eye, as the operation is such a rapid one. Hitherto I have found that the subcutaneous injection of cocaine, in these cases, is unsatisfactory. I have had to administer either nitrous-oxide gas, or chloroform, to several patients who were very nervous, and sometimes also to women, but as a rule patients bear the operation very well.

No dressing other than a dusting of dermatol, &c., in powder, need be employed; the parts should be kept absolutely clean, and the stitches removed on the fifth to seventh day. This is best done by first dividing the three twisted strands, then the eyebrow sutures on each side of, and close to the central knot should be divided and the two halves from either end withdrawn; then each loop embracing the lid margin is cut, and the wire being soft, is easily withdrawn by simple traction. As a rule, there is scarcely any œdema following the operation, but should it occur, the administration of a purge will usually prove beneficial; if, however, it does not subside, a cold lead-lotion fomentation must be kept constantly applied over the parts until the swelling is reduced.

After the lapse of four to ten days from the removal of the stitches, it is most difficult, as a rule, to realise except on very close examination, that the eyelid has ever been interfered with.

The only cases of recurrence which I have seen after this operation, were when the eyelid had been previously operated on unsuccessfully, and considerable deformity had been produced.

In those cases where there are only one or two mis-directed eyelashes, I formerly cauterised them to their

base, either with a fine wire-point attached to an electric battery, or that of an ordinary actual cautery. But I am of opinion that it is much more effectual and less painful to incise the skin of the eyelid margin vertically, and remove the eyelash in question, afterwards closing the wound with a silk stitch. In those cases where there is only a small group of eyelashes, and these placed closely together, it is better to make an incision along the eyelid margin, exposing their bases, and then pass a heated cautery-point over them. This method cannot, however, be employed when the condition of trichiasis is a total one, as the resulting cicatrix only renders a recurrence of the malady inevitable.

In the operation of tarsal re-position, here described, it is necessary to observe the following three points when performing it, in order to ensure its success:—

(1) The tarsus must be divided along its entire length, and in its whole thickness.

(2) The separated marginal portion of tarsus must be forcibly everted, because the ordinary traction exerted by sutures is not sufficient.

(3) The securing of the vertical twisted strands to the eyebrow is absolutely essential, in order to maintain the parts at complete rest and in proper position during the process of union and healing.

I performed the operation, in its imperfect forms, in 674 cases, with 4 per cent of failures, caused principally by stitches sloughing out; but this adverse factor has now been overcome since performing the operation as here described, which I have now done in 374 instances, and with invariable success, except in nine cases, where the eyelids were greatly deformed owing to previous operation. With other methods derived from text-books, &c., I operated in 117 instances, with varying success, and nearly always with some after-deformity.

I have also operated on 431 cases of partial trichiasis, by one of the above described methods, thus making altogether a total of 1596 operative interferences.

My reasons for mentioning the foregoing figures are simply to emphasise the fact that this method of treatment is not mere theory, but on the contrary, is one which has been worked out practically on a sufficiently large scale to test its usefulness.

A. E. DAVIS (New York). Accommodation in the Lensless Eye. *Manhattan Eye and Ear Hospital Reports*, January, 1895, p. 41.

It is a well established fact that in certain exceptional cases an eye from which the lens has been removed has good vision both for distant objects and for reading with the same glass. Whether this phenomenon depends upon a true accommodative change, or upon certain conditions distinct from an alteration in the refracting media, remains, in spite of much discussion, an open question. The author of this paper reviews the literature of the subject and puts on record two cases in which the apparent retention of accommodative power after the removal of the lens was made the subject of very careful investigation.

In the author's first case, that of a man aged 42, the eye, nine months after the extraction had, with a glass of + 11.5 D., V. $\frac{20}{10}$ Snellen, and with the same glass in the same position on the nose could read Jaeger No. 1 from 14 to 18 inches. Later with unaltered refraction and distant vision he could with the same glass read Jaeger No. 1 from 8 to 22 inches, holding the type in the usual reading position slightly below the centre of the glass. He did not tilt his head or the glasses. When the type was held higher directly in front of the glass he could not read quite so well as in the former position. The acuteness of vision both for near and distant objects was not altered when the lid was held away from the globe with the finger or with the speculum. After free use of scopolamine (to paralyse ciliary muscle) distant vision was still $\frac{20}{10}$ and Jaeger No. 1 was read at nine inches, with the same glass as before. During the effort of reading at a short distance the fellow

eye, covered by a screen, made the movement of convergence and its pupil contracted. Distant vision with the glass above mentioned was made worse by the addition of a $+ .50$ D. spherical; it was not altered by the addition of a $- .50$ D. spherical; it was made worse by a $- .75$ D. spherical, which would appear to show that he could exert an accommodation of $.50$ D. even for distance. A round illuminated aperture of 3mm. diameter, viewed at 20 feet with the $+ 11.5$ glass, appeared elongated in the vertical meridian when a $+ .5$ was added, but this test gave contradictory and uncertain results when the lid was held up and after the use of scopolamine. The ophthalmometer showed total absence of astigmatism in distant vision; it showed a slight decrease of refraction in the horizontal meridian and a slight increase in the vertical, producing a total astigmatism of nearly 1 D. during strong effort at near vision, the direction of the visual axis remaining the same as in distant vision. This change in the cornea took place also when the lids were held open with a speculum, and even when the ciliary muscle was paralysed with scopolamine; it must therefore be attributed to the action of the external muscles of the eye. With the ophthalmoscope no change could be detected in the length of the optic axis when the eye passed from distant to near vision. The fundus of the eye was normal, the media perfectly clear. The pupil was an irregular oval from the iridectomy, and free from membrane except at the edge; its transverse diameter was 3.5 mm., its vertical about 7 mm.

In the author's second case, that of a boy, aged 13, another surgeon had operated by discission, &c., on both eyes for congenital cataract. The right eye with $+13$ D. had V. $\frac{20}{60}$, which fell later to $\frac{20}{300}$ through capsular opacity. It showed no trace of accommodative power. The left eye with $+16$ D. had V. $\frac{20}{30}$, and with the same glass in the same position could read Jaeger No. 1 from 10 to 18 inches. This apparent accommodative power was not notably diminished by excluding the action of the eyelids, or by paralysing the ciliary muscle. Distant vision was made worse, both by $+$ and $- .5$ D. spherical added to

the distance glass, and either of these added glasses transformed a distant circular aperture of light into an oval. An effort at accommodation elongated the circle slightly in the vertical meridian. This last test gave doubtful results under scopolamine. The ophthalmometer showed that the cornea underwent absolutely no change of curvature in looking from a distant to a near point in the same line of vision. The ophthalmoscope showed no change in the length of the optic axis under the same circumstances. The pupil was nearly circular and active, 3.5 mm. in diameter, but limited at the side by a band of membrane, giving it the character of a vertical slit 2 mm. wide and 3.5 mm. long.

Before stating his own conclusions the author reviews those of other writers on this question, the result being that no hypothesis hitherto advanced appears to afford a completely satisfactory explanation. Two high authorities, Helmholtz and Donders, asserted that the lensless eye retains no trace of accommodative power. We may accept this dictum as true for the eyes examined by them, and probably for the great majority of lensless eyes, but we are not thereby obliged to deny the possibility of exceptions. Foerster reported no less than twenty-two cases in which some accommodative power appeared to be retained, the amount being greater in the younger than in the older patients. He assumed, but did not definitely prove, that it was due to an increase of the corneal curvature during near vision. That such an increase does occasionally occur both in the lensless eye, and in eyes with normal lenses, is proved by the first of the cases here recorded, and by another instance in a healthy eye detailed by the author, and it is further proved that the change of corneal curvature is due chiefly, if not entirely, to the action of the external muscles, for it occurred when the ciliary muscle was paralysed, and when the action of the lids was excluded. But this is at best only a partial explanation of the phenomenon, for in the author's second case the ophthalmometer proved an entire absence of corneal change during the act of apparent accommodation. Woinow reported eleven cases of the kind, and attributed

the phenomenon to three factors: to a change occurring in the anterior surface of the vitreous, to a change in the length of the optic axis due to action of the ciliary muscle, and to a similar change due to the action of the external muscles. The influence of the vitreous is denied by Davis, on the ground that the index of refraction is the same as that of the aqueous. The action of the ciliary muscle is excluded in some cases, at least by the persistence of the phenomenon after the full use of a mydriatic; moreover, if Davis's observations with the ophthalmoscope, which showed no change in the refraction of the eye, were correct, neither the ciliary muscle nor the external muscles could have acted in the way supposed. Cases reported by Loring and Silex are also cited. The latter writer concluded that the aphakial eye has no accommodation, and that the exceptional ability to read near type with distance glasses is due to an exceptional faculty of overcoming dispersion circles.

Davis concludes that the change in the curvature of the cornea, proved to occur in some cases, is too slight even in these to explain the phenomenon, and may be excluded. He attributes it to "the ability of the patient to interpret dispersion circles"—a phrase of rather doubtful meaning. He invokes four factors: the great increase of the retinal image by the substitution for the crystalline lens of a lens in front of the eye; the narrowing of the pupil by membranes partially filling it; the exceptionally high acuteness of vision met with in certain cases; and the slight tilting of the glass which some patients employ. But of these four factors the first is present more or less in every successful case of cataract extraction, and the second, a limitation of the pupillary area by opaque membranes, is quite common; further, in the author's own second case tilting of the glass is expressly excluded, and the acuteness of vision was by no means so exceptional as to explain the reading of J. 1 at ten inches with the distance glass. It appears to us that a satisfactory explanation is still wanting. Would not the careful use of the shadow test in a suitable case throw some decisive light upon the matter?

P. S.

Report on the Value of Objective Tests for the Determination of Ametropia. *Journal of the American Medical Association, Sept., 1894.*

It may be interesting to note very shortly the conclusions of this report which has recently come into our hands, particularly as an article on optometry by the subjective method appears in the present number of this Journal.

All the members of the committee agree that the objective methods of determining ametropia cannot entirely replace the subjective method, and that the latter must be regarded as an essential part of a complete examination. Its application, however, is limited to the determination of refraction of the fixation point, and implies moderately good vision, intelligence and honesty in the patients who are being examined. The objective method on the other hand is much less restricted in its applicability.

The value of the individual tests is considered separately.

(1) *Ophthalmoscopy*.—The ability to measure by their refraction the relative position of different points seen by ophthalmoscopy, gives it an important value very imperfectly shared by skiascopy alone. The committee are in some doubt as to the ability of the ophthalmoscopic examination to reveal latent hyperopia. In their experience it has not shown any pronounced superiority over the subjective method in this particular. They admit the exactness of its results to within half or three-quarters of a dyoptre in capable hands, and under proper conditions, but draw attention to the difficulty of the observer's controlling his accommodation after long spells of eye-work, and the consequent liability to error which in these circumstances is apt to occur. The size of the patient's pupil is also a matter of importance. If the patient's pupil be unduly small, the accuracy obtainable by direct estimation is correspondingly diminished by the diminution of the circles of diffusion on the observer's retina. On the other hand, if the pupil, as usually happens, be moderately dilated, portions of the dioptric media will be exposed at the margin of the pupil that differ considerably in their refractive power from the visual zone, and thus the refrac-

tion which may really be obtained by the ophthalmoscope may differ essentially from the refraction of the visual zone which it is desired to estimate.

(2) *Ophthalmometry*.—The Committee think that the name might more appropriately be *keratometry*. It measures the corneal curvature, and this curvature alone, and its value as a test of ametropia, is entirely dependent on the relation of the corneal curvature to the total refraction of the eye. Statistics now before the profession enable us to judge as to the usual relation of the corneal to the total astigmatism, and the conclusion that the Committee reach from a consideration of these statistics is that the chances of conformity between the corneal and total astigmatism are not sufficient to justify reliance upon the ophthalmometer as a means of showing the cylindrical correction required in the individual case. "The practical value of ophthalmometry, therefore, is mainly that of a method of examination that will make an important suggestion as to the presence, degree or direction of astigmatism which, when followed up by other methods of measurements, may effect a greater saving of time."

(3) *Skiascopy*.—In the opinion of the committee skiascopy is on the whole the most accurate and reliable objective method of estimating ametropia. It measures the total refraction of the eye, whether affected by accommodation or not. When properly directed towards the macula it estimates the refraction of the visual zone as in the subjective method, "and at the same time it measures refraction outside the visual zone as it is possible to measure it in no other way." The definiteness or indefiniteness of the visual zone is the condition which mainly determines the accuracy of estimation by this method. If the visual zone be too small to study at a convenient distance, or if its refraction passes imperceptibly into entirely different refractive conditions surrounding it, the difficulty of applying the test is greatly increased and the accuracy of its results much impaired. Eyes with the more regular visual zone are the rule, but the others are common enough to cause serious difficulty in many cases.

N. M. ML.

ABNORMAL ASSOCIATED MOVEMENTS OF THE EYELIDS.

BY WALTER W. SINCLAIR, M.B., IPSWICH.

DURING the past twelve years occasional cases of unusual associated movements of the eyelids have been published. Six cases of association-movement between the upper eyelid and the lower jaw have come under my own observation, and, as I have looked up the cases hitherto recorded, I have thought it worth while to bring them together.

I believe that cases of associated movements are comparatively common, and that many instances have been met with by ophthalmic surgeons which have been regarded as curiosities, and have not been put on record.

By analysing and grouping together these cases, some interesting points are brought out, and, although the list here given does not pretend to be a complete one, the hope that these notes may be of some future use is my chief reason for publishing them.

SERIES I.

Cases in which certain movements of the lower jaw are associated with an upward movement of the upper eyelid.

The condition, as most frequently met with, is as follows:—There is one-sided, congenital ptosis, varying in degree, and with or without paresis of the superior rectus. The drooping eyelid cannot be voluntarily raised, but it is

vigorously raised when certain movements of the lower jaw occur. The movement is strictly limited to the upper eyelid (levator muscle) and the patient cannot control it. It is best seen when the patient is looking down and moving the jaws as in ordinary mastication of food.

I have divided this series of cases into the following groups:—

GROUP I.—Cases of one-sided congenital ptosis in which the drooping eyelid is raised both when the mouth is opened (digastric ?) and also when the jaw is directed to the opposite side (external pterygoid).

Case 1.—Becker (*Jahresber. d. Gesellsch. f. Natur. u. Heilk., in Dresden*, 1890-91, s. 65).¹

Case 2.—Blok (*Weekbl. f. het. Nederl. Tijdschr. voor Geneesk.*, ii., 6). In this case no movement was noticed if the patient looked upwards, and it is stated that the movement became more marked as time went on.

Case 3.—Blok (*loc. cit.*). This patient was the brother of Case 2. The movement of the eyelid occurred in association with swallowing and also when the mouth was kept shut and the cheeks were puffed out, as well as with the jaw movement.

Case 4.—Proskauer (*Centralbl. für prakt. Augenheilk.*, April, 1891).

Case 5.—Goldzieher (*Budapest Kgl. Verein d. Ärzte, am November 5*, 1892). In this case, in addition to the movement of the drooping eyelid, if the chewing movements were very vigorous, the eye itself rolled downwards and outwards and became slightly proptosed.

Case 6.—Schapringner (*New York Med. Monatsschr.*, January, 1892).

Case 7.—Snell (*Sheffield Med. Journal*, July, 1893). In Mr. Snell's case the pupil on the affected side was smaller than its fellow, and that side of the face was less developed than the other.

¹ To avoid needless repetition, references only are given except when the case presented unusual features. Some of the foreign references are taken from Michel's *Jahresberichte*.

Case 8.—Dr. McIntosh (Ophthal. Soc. Meeting, October, 1894).

Of the six cases which have come under my own notice, three (Nos. 9, 10 and 11) are recorded in this REVIEW for March, 1893.

Case 12.—Male, aged 18. Right congenital ptosis. He has no voluntary power over the eyelid. When the jaw is moved to the left a slight quivering movement of the levator is noticed. When he opens his mouth the eyelid is vigorously raised. There is no asymmetry of the face. Pupils equal.

Case 13.—Male, aged 17. Left congenital ptosis. Strong upward movement of the affected eyelid when he opens his mouth, or when he moves his jaw to the right. No voluntary power of raising the eyelid. Pupils equal.

GROUP II.—Cases of one-sided congenital ptosis in which the drooping eyelid is raised when the jaw is depressed, but is not raised with lateral movement of the jaw.

(NOTE.—I think it probable that some of the cases in this group belong to Group I., as in some of the records no mention is made of lateral movements of the jaw. I have, however, included in this group the cases in which the movement of the eyelid is stated to have occurred simply "when the mouth was opened," as well as those in which it was noted that the lid movement did *not* occur with lateral movement of the jaw.)

Cases 14 and 15.—Helfreich (Heidelberg Congress, 1887. *Festschrift für Alb. v. Kölliker*, 1887).

Case 16.—Ole Bull (*Archives of Ophthal.*, 1888, p. 144). This patient could voluntarily raise the eyelid if the other eye was covered.

Case 17.—Kraus (*Inaug. Dissert. Göttingen*).

Case 18.—Kraus (*loc. cit.*). This case was watched for several years, and the movement of the eyelid became less vigorous.

Case 19.—Kraus (*loc. cit.*). This case is remarkable in that after being watched for some years, the contraction of the levator ceased altogether.

Case 20.—Ole Bull (*Archives of Ophthalm.*, xxi., p. 354). In this case the eyelid could be raised voluntarily when the head was thrown back, the mouth being kept shut. When the other eye was covered the drooping lid could likewise be voluntarily raised as high as by opening the mouth, and the patient could check the associated movement by using the orbicularis.

Case 21.—Vossius (*Deutschmann's Beiträge z. Augenheilk.*, v., S. 1). This case is especially interesting. The patient had double ptosis and almost complete ophthalmoplegia externa present from birth. The left upper eyelid was lower than the right; it could not be raised voluntarily either by the levator or by the frontalis, but was strongly elevated when the mouth was opened. There was no movement of the right upper lid. A brother of this patient was likewise born with double ptosis and almost complete ophthalmoplegia externa, but in his case there was no associated movement.

Case 22.—Hubbell (*Archives of Ophthalm.*, xxii., p. 65). Here, in addition to right ptosis, there was right divergent strabismus and some downward deviation of the eye, which could not be raised above the horizontal, nor turned inwards beyond the vertical plane. The right eye was amblyopic. The upward movement of the eyelid occurred exactly in proportion as the jaw was depressed, and did not occur at all with lateral movement of the jaw. The movement could be checked by the orbicularis.

Case 23.—Bernhardt (*Neurolog. Centralbl.*, 1894, No. 9).

Case 24.—Bocci (*Gior. d. v. Accad. di Torino*, p. 580).

Case 25.—A woman, aged 39, brought a child to me for advice. I noticed she had slight ptosis on the right side. It was congenital and the superior rectus was weak. She had no voluntary power over the eyelid, whether the fellow eye was covered or not. Powerful upward movement of the eyelid takes place only when the mouth is opened. The two sides of the face are equally well developed. R. pupil, 5½ mm.; L. pupil, 5 mm.

Case 26.—The notes of this case were kindly sent to me by my friend Mr. Holmes Spicer. The patient at-

tended Mr. Nettleship's clinic at Moorfields. Boy, aged 3. Right partial ptosis. "Can raise the lid almost fully. Eye movements not defective. No fold in upper lid, except when he looks up. The frontalis acts chiefly when he looks up and the forehead is much wrinkled, but there is movement of the levator." Eyes not inflamed at any time. Healthy. Inclined to stammer. "When he eats the eyelid moves up and down." There is a definite, not very large movement of the eyelid up and down with each movement of the jaw. It is perfectly synchronous with the jaw movement, but not constant. The lid rises as the mouth opens, and the movement is entirely limited to the upper lid. It occurs with simple up and down movements only; with lateral movement not at all, so far as could be judged. Difficult to be certain on account of the patient's age.

GROUP III.—Cases of one-sided congenital ptosis in which the drooping eyelid is raised with lateral movement of the jaw (external pterygoid action), but not with simple opening of the mouth.

Case 27.—Marcus Gunn (*Trans. Oph. Soc.*, 1883).—[This is, so far as I have ascertained, the first recorded case of associated movement of the eyelid and jaw.] The pupil on the affected side was smaller than its fellow, and that side of the face was less developed than the other (compare with Case 7). The drooping lid was strongly raised when the external pterygoid of the same side was thrown into action. No mention is made of any movement occurring in the eyelid when the mouth was simply opened.

Case 28.—Schapringer (*New York Med. Monatsschr.*, Jan., 1892). Movement of the drooping lid when the jaw was moved to the opposite side (external pterygoid). There was no movement of the eyelid either when the mouth was opened, the chin thrust forward, or the jaw directed towards the same side.

GROUP IV.—Cases in which similar associated movements of one upper eyelid with movements of the lower jaw occur, but in which there is no ptosis.

Case 29.—Fuchs (Heidelberg Congress, 1887). Discussion on Helfreich's cases (Cases 14 and 15).

Case 30.—Fraenkel (Heidelberg Congress, 1887). This case is remarkable. There was no ptosis when the patient was first seen, but when observed some years later it was noted that ptosis had developed and that the lid movement had become less marked. It occurred while chewing. (*Michel's Jahresber.*, 1891.)

Case 31.—Fraenkel (*Klin. Monatsbl. f. Augenheilk.*, S. 93). Upward movement of the eyelid on one side while eating, or when the mouth was opened. The movement was present only when the eyes were directed downwards. There was no ptosis.

Case 32.—(The notes of this case were kindly sent to me by my friend Mr. Eales.) A young lady, aged 19. Since birth her left upper eyelid "has jerked up and down when she eats." The movement was well marked, the eyelid rising in proportion as the mouth was opened. All the ocular movements were good and there was no ptosis.

An analysis of this series of cases shows that this associated movement is met with more frequently on the left than on the right side. Of 25 cases, the left side was affected in 18, the right side in 7 only.

With regard to ptosis, it was present in 27 of the 32 cases; absent in 4 (including Case 30, in which, however, it developed later); doubtful in 1 case. Of the 27 cases in which ptosis was present, the superior rectus was paretic in 10 (including Case 21), in which there was almost complete ophthalmoplegia externa.

Two explanations have been offered of these movements. The view advanced by Ole Bull, and shared by Rosenmeyer, Nieden and others, is that the movement is purely reflex, and is simply what we constantly see in children with blepharospasm who open their mouths when they want to open their eyes. "In the cases where ptosis is present, the patients have, because of the paralysis of the levator (and rectus superior) no

inducement to check synergetic movement raising the lid on the affected side." As quite opposed to this view I would point out: (1) that the movement under consideration is one-sided, and is strikingly confined to the upper eyelid; it is as different from the facial contortions of patients with blepharospasm as it can be, for in them the eyebrows are raised (by the frontalis) much more than the eyelids, and on both sides. (2) That cases occur in which there is no ptosis. (3) That cases are met with in which the levator contracts with lateral movement of the jaw only. The other explanation, with which most observers agree, is that originally given by a committee of the Ophthalmological Society in a report on Mr. Gunn's case (*Transactions*, 1883). This suggests that the levator receives nerve supply from the nuclei of both third and fifth nerves. Helfreich has suggested that in some of the cases the abnormal nerve fibres come from the nucleus of the facial. Hubbel, Helfreich and others have considered that there must also be imperfect development of the oculo-motor nucleus. This may be true of some cases, but the fact that instances are met with in which there is no ptosis or impaired upward movement of the globe, is opposed to its being true of "all cases" (Hubbel, *loc. cit.*)

Up to the present no case has been examined *post-mortem*, and in the present state of our knowledge, abnormal anatomical connection between the levator muscle and parts of the fifth nerve nucleus is the simplest explanation of this association movement.

SERIES II.

Cases in which contraction of the levator palpebræ superioris is associated with contraction of the rectus internus.

Case 1.—F. W. Browning (*Trans. Oph. Soc.*, 1890, p. 187). Male, aged 46. When he looked outwards, either to the right or to the left, the upper lid of the same side drooped,

while the other was slightly elevated. The lid movement was more marked on the left side. When he converged strongly, both upper eyelids were simultaneously raised above the horizontal—the left most so. As he followed the descending finger, the eyelids followed the globes down to the horizontal, but there remained stationary. All extreme movements of the eye produced coarse nystagmus.

Cases 2 and 3.—Dr. Sidney Philips (*Trans. Oph. Soc.*, 1887, p. 306). Condition present in two brothers, aged 7 and 3 years. When the eyes were directed outwards, to the right or to the left, the upper eyelid of the *other* side drooped, that of the same side “remained raised.” Looking “up and out” or “down and out” produced the same phenomenon.

Case 4.—Pflüger (“XX. Congress of Heidelberg, S. 202). Female, aged 18. When looking to the left, the palpebral aperture was wide open; looking straight forward produced a slight drooping of the *right* upper eyelid, while looking to the right brought on complete ptosis of the right eyelid. The patient could not overcome this ptosis voluntarily. Looking up (and to the right) did not alter the position of the eyelid. Strong movement to the left produced extreme opening of the palpebral aperture, which was maintained if the eye was likewise directed downwards.

In this series of cases, the internal rectus and the levator of the same side contract together and become relaxed together. In all except the last case (No. 4), the abnormality was bilateral, and Dr. Sidney Philips suggests that unusually close connection between the two third nerve nuclei may explain this.

SERIES III.

Cases of paralysis, or paresis, of one external rectus, in which movement inwards of the affected eye is associated with contraction of the orbicularis muscle and retraction of the globe.

The following remarkable cases have not hitherto been

published, and, so far as I am aware, no similar cases are on record.

*Case 1.*¹—"Female, aged 9. Is said to have squinted with the left eye since birth (external strabismus). The squint is worse when she has a cold, &c. The left eye is said to have been smaller than the right at birth. Her mother has epileptic fits. Movements of the right quite good. Movements of the left very defective; movement out defective; movement in impaired. Up and down movements good. When the patient looks to her right, the left eye is partly closed, from partial closure of both upper and lower eyelids, and the whole eye is partly retracted. The action of both orbiculares is good. When the patient looks to her left, the lids of the right eye are partly closed, but much less so than in the left eye when she looks to the right.

"Under atropine. $\left\{ \begin{array}{l} \text{R.} + 1\text{D. sph.} = \frac{6}{6}. \\ \text{L.} + 1\text{D. sph.} = \frac{6}{6}. \end{array} \right.$

"Teeth good. Pupils act normally, and show no contraction when the eyes are turned to the right."

*Case 2.*²—"A. L., male, aged 6. Has complained of his eye for the last few weeks. For two years his mother has noticed that he looked at things with the right eye only. No history of illness, (diphtheria, &c.), or of injury.

"V. $\left\{ \begin{array}{l} \text{R.} = \frac{6}{12} \\ \text{L.} = \frac{6}{12} \end{array} \right. \text{H.} = \text{about 1D.}$

"The movements of the right are quite good. Movements of the left very defective; worst when looking *in*. *When the right eye is closed* the left is brought hardly past the middle line when looking in, and the palpebral fissure is slightly closed. Movement out is much less than normal; movement up, and up and out, nearly normal; movement down, and down and out, normal. *When the right eye is open*: If he looks to his right, the palpebral fissure of the

¹ For the notes of this case I am indebted to Mr. H. Parker, under whose care the patient was at the Central London Ophthalmic Hospital.

² For the notes of this and of the following case (Case 3) I have to thank Mr. Nettleship.

left is almost closed—closing more the further he looks to the right. The closing begins directly the right eye has passed the middle line. The left eye looks more retracted than the right, and when he looks to his right, the left eye is much retracted. Pupils, $R > L$; both react to light, but the left acts very slowly."

Case 3.—"J. G., female, aged 6. History of a fall when $1\frac{1}{2}$ years old. Brought because she does not get on at school. R. = $\frac{6}{8}$ Hm. 3 D. J. 1. L. = fingers. J. 10 at 10 cm. Cornea — 12 mm. The peculiarity is in the movements of the left eye and eyelids. (a) The eye looks smaller than the right, but the fissure is of the same width. (b) There is no movement of the left outward beyond the middle line. (c) Vertical movements are full. (d) Inward movement of the left perhaps not quite full. (e) When she looks to her right, the left eye: (1) Is markedly retracted, leaving quite a fissure between the eye and the lower lid at the outer part. The eye can be seen to go back. (2) The left eye sometimes lags in going inwards. (3) If looking at all above the horizontal, the eye goes upwards beneath the upper lid, as well as inwards. (4) If looking below the horizontal the eye does not go down. (5) These phenomena are accompanied by partial closure of the palpebral fissure in which both eyelids take part, the lower especially showing pulling muscular movement. Pupils equal and both active. Facial muscles equal on both sides."

Case 4.—(A private case of Mr. MacLehose, who very kindly sent me the notes.)

Enophthalmos of left. Paralysis of left sixth, and associated action of left orbicularis with lateral deviation of eyes to the right.

F. F., a girl, aged 10. Parents have noticed since she was 4 years old that the "left eye was smaller than the right." They cannot date the onset of the sixth nerve paralysis.

No history of injury or of any special illness. Child exceedingly healthy looking, well formed, teeth good; no suspicion of hereditary syphilis. Parents healthy.

The left eye shows moderate permanent retraction (enophthalmos). The globe is apparently fully developed, cornea of same size as the right.

Movements of the right are good in all directions. Movement of the left outwards beyond the middle line is abolished. All the other movements of the left are full. There is *no apparent weakness of the left internal rectus* (this point was very carefully examined).

As in the other cases, when the patient looks to the right the left palpebral fissure becomes much narrower than the other. This narrowing is more marked when she looks to the right and *down*, than when to the right and up.

There is no corresponding narrowing of the right palpebral fissure when she tries to look to the left. There was, I think, slight further retraction of the left globe in association with lateral deviation to the right, but it was not well marked, and I could not satisfy myself that it invariably occurred.

No ptosis, no affection of the seventh or fifth nerves. Sensibility of corneæ and cheeks equal and very acute. Pupils briskly active to light, and equal. Vision R. and L. each = $\frac{6}{5}$ Hm. 1. J. 1 from 4 to 20. Fundi normal.

Mr. MacLehose adds: "The permanent enophthalmos in this case may of course be a mere accidental coincidence and have no relation to the temporary retraction which was so marked in some of the other children; on the other hand it is possible that it is, as it were, a further stage of the same condition due to some cause the nature of which we do not understand. I cannot formulate any theory which seems to me to satisfactorily meet the case."

Case 5.—(I have also to thank Mr. MacLehose for the notes of this case, seen in Mr. Gunn's clinic at Moorfields.)

R. N., a girl, aged 4. Paralysis of left sixth nerve first noticed when the child was about fifteen months old.

Movements of the right eye are full. The left eye cannot be moved outwards beyond the middle line; other movements of the left good, including rotation inwards, there being no evidence of paralysis of the left internal rectus.

On lateral deviation to the right, the left palpebral fissure partially closes, the eye is retracted and also rolls somewhat upwards.

Pupils equal and active. Child healthy; parents alive and well; family history good.

It is noteworthy that in all the cases in this series the left eye was affected (*c.f.* Series I.). It is difficult to explain why the left side should show association movements so much more frequently than the right does.

The external rectus was paralysed altogether, or weak, in each case; while in Cases 1 and 3 the internal rectus is noted as being weak, and in Case 2 very weak.

These cases are difficult to explain. Referring to Cases 1, 2 and 3, Mr. Parker suggests an ingenious theory, based on the hypothesis of Mendel. According to this hypothesis, "The frontalis and orbicularis palpebrarum muscles, although peripherally supplied by the facial nerve, are 'eye muscles,' and form the oculo-facial group, whose central innervation is the oculo-motor nucleus." (See Mendel, *Neurol. Centralbl.*, 1887, p. 537; *Brain*, Pt. lvi., p. 473; *R. L. Ophth. Hosp. Reports*, Dec., 1892, paper by Turner on "Pupil Reaction.")

Accepting this hypothesis and applying it to the cases under consideration, Mr. Parker writes: "The internal rectus being paralysed, when an attempt is made to turn the eye inwards the superior rectus and inferior rectus are stimulated to their utmost and produce a certain amount of inward rotation; but the excessive innervation of the oculo-motor centre will stimulate also the other muscles supplied, of which (according to the hypothesis) the orbicularis is one. The retraction of the globe will be accounted for by the action of the superior and inferior recti, as, when they act together to produce internal rotation, they must at the same time cause retraction."

This suggestion omits from consideration the paretic condition of the external rectus which is present in *all*

the cases ; and moreover, it quite fails to meet the facts of Cases 4 and 5, in which there was no weakness of the internus at all.

It is to be noted that a permanent enophthalmos was observed in Case 4, and was probably present in the other cases, as it is noted that the affected eye "looks smaller" than its fellow, while in Case 3 this was found to be *not* due to any reduction in the width of the palpebral aperture. Mr. Marcus Gunn suggested to me in a letter that this "enophthalmos and ptosis" might be "due to a loss of sympathetic innervation" affecting Müller's muscle. The sixth nerve contains sympathetic fibres, and it is quite possible that the permanent enophthalmos may be due to paralysis of Müller's muscle. I would suggest that measurement of the palpebral aperture before and after the instillation of cocaine would show whether the Müllerian muscle of the eyelids was paralysed or not. Mr. Gunn's suggestion does not, however, explain the visible retraction of the globe which takes place with inward movement, nor the active contraction of the orbicularis associated with it.

These cases of association-movement will probably not be correctly explained until the opportunity of a *post-mortem* examination occurs.

ANGIO-NEUROTIC ŒDEMA OF THE OCULAR CONJUNCTIVA.

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IN February last I was called to see a man, 32 years of age, a head waiter, who, they informed me, had "got some kind of poison in his eyes, and that they were swollen shut." I presumed that he had gonorrhœal ophthalmia, but examination negatived this idea. Both the upper and lower lids of each eye were swollen and red, with a fold of ocular conjunctiva protruding from between the lids, forming a large roll above and below the cornea, but there was absolutely no discharge. This roll of swollen conjunctiva had a yellow œdematous appearance, and was somewhat firm to the touch. The corneæ were clear. He resisted a good deal when the lids were separated, and complained of great photophobia and pain. This condition, he informed me, had been present for about twelve hours, but his eyes had felt irritable for twenty-four hours previous to this. The swelling of lids and ocular conjunctivæ was ushered in by severe pain in the eyes and along the track of the supra-orbital nerves, as well as in the back of the head and shoulders. He also had considerable pain in the lumbar region. His urine was scanty in amount and highly coloured, loaded with urates and some phosphates, but free from albumen and sugar. He was constipated and had some symptoms of stomach derangement. The heart was normal. Two weeks before this attack he had pain in his stomach, with a feeling of heaviness there after eating. Six months previously he had an attack which his wife pronounced "hives." The local eye treatment was confined to the application of

iced cloths and a 2 per cent. solution of antipyrine dropped between the lids every two hours.

In three days' time all the conjunctiva and lid œdema had subsided. He could open his eyes freely to the light, all pain in the eyes and elsewhere about the body had ceased, vision was normal, and the ophthalmoscope showed the interior of the eyes to be healthy.

Now the question arises, how should this case of conjunctival œdema be classified? Dr. Charles J. Kipp reports a similar case in vol. vi., page 415 of the *Transactions of the American Ophthalmological Society*. He names his case one of "bilateral inflammation of Tenon's capsule, in connection with profound mercurial poisoning." The only points of difference between Dr. Kipp's case and mine lie in the causation, and that in his case there was a protrusion of the eyeball. In mine there was no exophthalmos.

Dr. Swan M. Burnett, in the *Archives of Ophthalmology*, vol. xxi., page 259, reports a very similar case to mine, of "chemosis of the conjunctiva and lids by the ingestion of a single grain of quinine." He does not say if his patient experienced pain in the eye or not. He adds, "in early life quinine taken in any quantity produced urticaria."

Dantone reviews a case on page 149, vol. xxi., *Archives of Ophthalmology*, reported by Geraita, which he calls "diffuse lymphoma of the conjunctiva." This case seems to have been very similar to mine, and microscopical examination of a few of the excised pieces of the conjunctiva revealed an extensive collection of lymphoid cells. After having gone through an enormous amount of ophthalmological literature, I have succeeded in finding only these three cases which bear anything like a close analogy to the one which I have reported. Marked œdema of the ocular conjunctivæ is a prominent symptom of orbital cellulitis; but this should not be confounded

with transient œdema. It is not uncommon to find œdema of the conjunctiva from malignant growths in the nose or its accessory cavities, or from acute or chronic inflammations of these cavities, attended with purulent nasal discharge. In my case there was no disease of nose or accessory cavities. We find conjunctival œdema again in advanced stages of disease of the kidneys and heart, but it is not transient in character. I remember a very marked instance of conjunctival œdema in a woman about 80 years of age, who had an aneurism of one of the large cerebral arteries, and it is not infrequent in thrombus of the lateral sinuses.

Very few of our text books on medicine say anything about angio-neurotic œdema. Osler refers to it briefly, and seems to think it a form of giant urticaria and dependent upon stomach derangement. On page 209 of the *New York Medical Record*, vol. lvi., Dr. M. Allen Starr, in a very interesting paper on "Localised Transient Œdema," says it is also called "Angio-neurotic Œdema," but that this term "implies a knowledge of the pathology which is not yet established," nor does he attempt to go into the pathology of it, and dismisses it by saying, "as to its nature or pathology nothing is known." He reports three cases, in two of which the exciting cause seemed to be exposure of the affected parts to cold air or cold water. In his third case no causative influence could be ascribed; the œdema was confined to the left hand, and dipping this hand in cold water increased the swelling and aggravated the pain. In his cases the stomach could not be regarded as having anything to do with the signs manifested, nor do they bear any resemblance to those of urticaria.

Crocker¹ speaks of "acute circumscribed œdema" as one of the "variations of urticaria," or so-called Quincke's

¹ "Diseases of the Skin," second edition.

disease, in which the orbital tissue, or that of other parts of the face, may swell up into a large tumour, or there may be a large ill-defined swelling of a greater portion of the limb or other part of the body from subcutaneous œdema. Crocker takes the stand that acute circumscribed œdema is one form of urticaria.

Quincke¹ and Strubing² reported cases under the name of acute circumscribed cutaneous, or angio-neurotic œdema, in which the œdema affected chiefly the face, several times the mucous membrane of the tongue, soft palate and larynx, although in a considerable number of instances the trunk showed like lesions.

Dr. M. B. Hartzell³ in a paper on "Acute Circumscribed Cutaneous Œdema," reports the case of a man aged 40, who had recurring attacks of acute circumscribed œdema of the face, head, larynx and left forearm. He was subject to attacks of urticaria of a mild type. "Gastro-intestinal derangement was completely absent both during the attacks of urticaria and cutaneous œdema." Hartzell says, "while cutaneous œdema presents many features which indicate a close relationship with urticaria, yet it possesses characteristics of its own which fairly entitle it to separate consideration."

I believe my case to have been one of true angio-neurotic œdema of the conjunctivæ. That acute circumscribed œdema seems to have a special fondness for the face there is a preponderance of opinion. That it involves mucous surfaces there is no doubt, inasmuch as cases have been cited where the tongue and larynx were affected. That it may affect the mucous membrane of the eye as well as the lids, I deem to be probable. It is certainly a rare occurrence, as no mention of such a condition can be found in our text books on the

¹ *Monatschft. f. Praktische Dermatol.*, 1882.

² *Zeitschft. f. Klin. Med.*, Bd. ix., p. 382.

³ *University Med. Mag.*, vol. ii., p. 410.

eye, nor can any reported case be found in our most prominent ophthalmological literature. The condition may be easily mistaken for orbital cellulitis or tenonitis, but its transient character, together with the history of previous attacks of urticaria, should lead to its proper classification. The local treatment probably does not amount to much; constitutional medication, such as has been found of value in urticaria, should prove efficacious.

BAQUIS. Amyloid Degeneration of the Cornea.
Annali di Ottalmologia, Fascic. iv., 1895.

Baquis relates a case in which he accidentally came across this condition, whilst examining the cornea of an eye which he had exenterated. The patient was a man 61 years of age, whose general health was good; when 14, both eyes were attacked with purulent ophthalmia; the left recovered, but the right became blind; thirty years later it received a blow and became painful and irritable. When seen by Baquis, the lids were trachomatous, the cornea slightly encroached upon superiorly by the limbus, otherwise clear, except in the lower and internal quadrant, where there was a yellowish spot, behind which the iris adhered to the cornea. Pupil only partly visible; inactive to mydriatics. Behind the pupil a membrane could be seen. T. soft, vision *nil*. He performed exenteration; the iris and ciliary body were atrophied, the lens shrunken and adherent to the iritic membrane.

Microscopical examination of cornea.—The epithelium was unaltered; Bowman's membrane had disappeared, not only in the region of the leucoma, but over the whole extent of the cornea. Beneath the epithelium, and espe-

cially in the peripheral portions of the cornea, new formed tissue was to be seen, rich in capillaries, which, starting from the limbus, ran towards the leucoma, but did not reach it; leucocytes were abundant along the course of the vessels. The lamellæ propriæ were normal; the corneal corpuscles showed no trace of degeneration or nuclear division. Descemet's membrane was in parts covered by a thin exudation rich in red corpuscles; at the margin of the anterior synechia it terminated in a sort of fringe. In the region of the leucoma the corneal epithelium was normal, but rested directly on the corneal laminæ; in parts new-formed connective tissue intervened, and islands of the latter also occurred in the deeper corneal layers. Where the iris was adherent, longitudinal bands of fibrous tissue, simulating the corneal lamellæ, had been developed. In the portion of adherent iris, the circular muscle fibres were still well preserved; also the pigment cells, and some of the vessels. But the vessels in the "greater vascular circle" showed a conspicuous hyaline degeneration of the middle tunic and adventitia.

The most noteworthy fact, however, was the presence in the superficial layers of the substantia propria of roundish masses of various size, isolated and confluent, yellowish-white in colour, and composed of a shining substance like drops of fat. They occupied the inter-lamellar lacunæ, or irregular spaces, which they exactly filled; in parts surrounded by compressed corneal lamellæ, at others by scattered cells whose nuclei did not stain well. Only at one point did they come in contact with the corneal epithelium. In the deeper strata the little masses were very minute, as in calcareous infiltration.

Reactions of the substance.—(1) Insoluble in water, alcohol, ether, chloroform; (2) unaffected by saliva, alkali, or acid; (3) with a 2 per cent. glycero-aqueous solution of iodine and iodide of potassium it at once turned mahogany red, the proper substance of the cornea remaining a citrine-yellow; the addition of dilute sulphuric acid intensified the mahogany red colour; (4) with methyl violet, after an immersion of some hours, a ruby-red tint developed; (5) with Böhrer's

hæmatoxylin, after prolonged immersion, and treatment with eosin, a deep violet reaction took place; (6) with alum carmine, after a short immersion, the result was a clear yellow staining, which turned on further immersion to a rose-violet.

These reactions all point to the amyloid nature of the substance.

Which elements furnish the amyloid substance?

Baquis was unable to find any amyloid or hyaline degeneration in either the fixed or the migratory cells, and concludes that, at least in his case, the amyloid matter was generated exclusively in the laminæ propriæ and the connective tissue fibres of the cicatrix.

Is amyloid degeneration a process by itself, or a subsequent phase in the evolution of hyaline substance? In the present case both the initial stage (to judge by the smallness of some of the masses) and the more advanced were present, but they alike gave the amyloid reactions, not the hyaline. Baquis thinks that amyloid degeneration, being a very advanced stage of protoplasmic alteration, could occur even in elements already degenerate, but is not necessarily preceded by degenerative changes.

As regards the cause of the amyloid degeneration, whether it is deposited *in loco* from the blood, as Virchow, Rindfleisch and Ziegler think, or whether it is the result of a local metamorphosis of albumin, as Cohnheim and Reklinghausen think, it at any rate always forms in places where the nutrition is impoverished. In this case the impaired nutrition was due to the adherent iris, for there only did the changes occur. The only other recorded case of amyloid degeneration of the cornea is that by Beselin (*Arch. f. Augenheilk.*, Bd. xvi., S. 130), in which, as the result of a phlyctenular ulcer perforating, the iris became adherent to the cornea and the eye became progressively staphylomatous, and was finally enucleated.

Frisch in 1877 had experimentally produced an amyloid condition of the cornea in rabbits (*Sitzungsber d. k. Akad. der Wissensch. zu Wien*, lxxvi., 3 Juli Heft., S. 12).

A full bibliography is appended to Baquis' paper.

W. WATSON GRIFFIN.

J. P. DOMBROWSKI (Peoria, Ill.) A Case of Primary Carcinoma of the Sphenoidal Sinus. *The American Journal of Ophthalmology*, August, 1895.

The extreme rarity of malignant tumours originating in the sphenoidal sinus justifies the record of this case. A woman, aged 50, came on account of impaired vision of the right eye, noticed for the first time six weeks before. For a few months she had suffered from attacks of headache, each lasting a day or two. Some months earlier she had lost the sense of smell following a violent "cold." The right eye had V. = $\frac{1}{5}\frac{6}{0}$; slight but distinct restriction of the visual field for white and for colours; on the temporal side there was the slightest blanching of disc. Left eye normal, with full vision. The nose, examined on account of some thickness of the voice, was normal. Urine normal. No symptoms of cerebral or spinal affection; no history of injury or specific infection.

Four months later she had continuous pain in the head, most marked in the temples and back of the head, and a feeling of pressure over the temples. The vision of the right eye was $\frac{1}{7}\frac{6}{0}$, disc paler, visual field restricted in all directions, especially so on the temporal side. Again the nose and post-nasal space were examined, but showed nothing beyond slight redness and congestion of the mucous membrane.

She was next seen fifteen months after her first visit. The right eye had been "blind" for six weeks. On examination she was found to have only light perception and the disc was atrophic. Her head had felt well most of the time, but for the last two months had troubled her very much, the pain being mostly in the left temple. Left eye V. = $\frac{2}{4}\frac{6}{0}$, field distinctly restricted, especially for colours, most markedly so in the temporal upper and lower parts of the field. Several examinations showed that both sight and the visual field varied. At times both improved. Her nose had lately felt more stopped up, and there was found a congested condition of the right middle turbinated bone, and a thin layer of pale grumous-looking tissue between it

and the septum. This growth did not reach below the middle turbinated bone. Pieces removed for microscopic examination showed that the tumour was a papillary carcinoma. After the removal of the posterior two-thirds of the middle turbinated bone, the tumour was found to be situated in the region of the sphenoidal sinus, the front wall of which was destroyed by the growth, and from within which pieces of it could be removed with a sharp spoon. The tumour seemed also to invade the posterior part of the ethmoidal labyrinth, and the posterior upper portion of the septum. At a later sitting the left middle turbinated bone was removed, as much as possible of the tumour scraped away, and a limited application of chromic acid made; at the same time a more radical operation was suggested.

This the patient declined, and placed herself under the care of a travelling catarrh specialist! who treated her for six months. Two years from the time of her first visit she returned; central vision of the left eye still $\frac{20}{40}$, but the visual field much more restricted. She complained chiefly of not being able to breathe through her nose. She would not consent to any thorough operation, but enough of the growth was removed to restore nasal respiration. Three months later another palliative operation was done, the growth still presenting in the same locality. The visual field had by this time shrunk considerably, especially above and below, but vision was still $\frac{20}{50}$. There were not then any symptoms of involvement of other cranial nerves; no signs of meningitis, thrombosis or abscess; memory and intellect were undisturbed.

A few months afterwards another palliative operation was performed at the patient's home. She died some months later with symptoms which pointed to involvement of the cranial cavity. An autopsy was refused.

Dombrowski has been able to find records of but two cases of primary malignant tumours of the sphenoidal sinus. One of these, reported by Albert, was found accidentally at a *post-mortem* examination. It was carcinoma, but the case had presented no special symptoms during

life. The other case, by Behring-Wicherkiewicz, was studied clinically, and at the *post-mortem* examination was found to be a sarcoma, which had penetrated into the nasal cavity, orbit, middle fossa of the skull, and had spread to the petrous portion of the temporal bone, and into the tympanum and mastoid cells.

Dombrowski points out the possibility of the growth having started in the posterior ethmoidal sinus, which in some skulls extends back far enough to be in close relation with the optic foramen. But primary malignant tumours of this region are equally rare, there being but three recorded cases, those namely of Billroth, Hoffman and Gerdy.

E. J.

E. JACKSON (Philadelphia). *Skiascopy and its Practical Application to the Study of Refraction. With twenty-six illustrations. Philadelphia: The Edwards and Docker Co., 1895.*

The author of this work, knowing that there are many ophthalmologists who do not yet recognise the full practical value of skiascopy—the shadow test in the estimation of refraction—writes with the object of bringing about its more general adoption. Its claims to fuller consideration are stated in the preface as follows:—

(1) Skiascopy is an objective test, independent of the patient's intelligence or visual acuteness, and more largely than any other independent of the patient's co-operation.

(2) It is by far the most accurate objective test. The limits of its accuracy depend on details of its execution and the skill and patience of the observer; but it does not require any rare natural qualifications to carry it, for many eyes, to the extreme limits of accuracy for subjective tests.

(3) It requires but little more time than the use of the refraction ophthalmoscope or the ophthalmometer, which are able to give very inferior information. It saves time in making a complete diagnosis.

(4) It requires no costly, complex, or cumbersome apparatus.

(5) It lays before the surgeon the refraction in each particular part of the pupil as it is revealed by no other test, and opens up the principal avenue for further advance in the scientific study of the refraction of the eye.

The book deals in successive chapters with the history of the method; with the optical principles on which it is based; the conditions of accuracy in its application; its use in the estimation of regular astigmatism; the appearances observable in conditions of irregular astigmatism, and of the spherical aberration which, in many corneæ, gives to the central or visual area a different refraction from that of the peripheral zone, and in conical cornea and some other anomalies of curvature. The last three chapters deal with the practical application of skiascopy with the plane mirror and with the concave mirror respectively, as regards the source and position of the light employed, and other details of the apparatus.

As the author is one of the editors of this Review, a critical discussion of his work would be out of place in these pages. We have for many years past insisted on the pre-eminent value of the shadow test, and would gladly follow Dr. Jackson through some of the details of his treatise, but, for the reason just stated, must be content to draw attention to its general scope and purpose.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

THURSDAY, OCTOBER 17, 1895.

E. NETTLESHIP, F.R.C.S., President, in the Chair.

The new President delivered his introductory address. He thanked the members for having elected him to the chair, referred to the loss which the Society had sustained by the death of Dr. Bristowe, and made some introductory remarks bearing on the value of special departments in general hospitals and their proper relationship to special hospitals. He then passed on to the subject proper of his address. The President said:—

If time allows I will refer to a few questions that seem to me very appropriate for our work at present; many of them have been already the subject of communications here. Some are examples of rare disease, every case of which is worth recording with all accompanying facts; others, subjects which seem capable of something approaching final settlement by the collective work of committees or by set discussions; others, subjects which for various reasons can for the present be most usefully dealt with in separate papers.

Amongst important rarities we find *sympathetic inflammation* occurring without known perforation of the exciting eye. Every such case should receive the most searching examination. It is said that an eye containing a malignant tumour may, without the occurrence of any perforation of its tunics, cause sympathetic inflammation. Most of the cases published in support of this statement break down on examination. I know of only two which seem free from objection—Mr. Bronner's case *O. Trans.* xiv., p. 215 (rupture of sclerotic), and Dr. Nielden's case, Ophthalmic Congress, 1894 (tumour).

Do foreign bodies retained within the eyeball often cause sympathetic inflammation? They are of course liable to set up recurrent attacks of pain, redness and doubtless

local inflammation, calling for excision at a long interval after the injury ; but the degree of danger of sympathetic disease appears not to have been settled. The question was especially raised by Mr. Priestley Smith (vol. xii., p. 191).

All cases should be recorded in which the *eyelashes or eyebrows become white* in the course of sympathetic ophthalmitis, or of other forms of malign uveitis (Mr. Tay's case, vol. xii., p. 29).

True Buphthalmos.—Mr. Juler has given one of, probably, the few instances showing the anatomical changes at a very early age (*Trans.*, xi., 240). Though usually progressing to blindness, we occasionally see cases in which the disease has been arrested with good sight. Both these points need further elaboration.

Detachment of the Choroid.—Two cases of this rare condition are described in detail by Mr. Story in vol. xi. and xii., with references to previously published cases ; and Mr. Mules has recorded two cases in vol. xiii. In Mr. Story's cases there was no opportunity for pathological examination ; in one of Mr. Mules' cases the eye was excised, but apparently no microscopical examination made. It is of extreme importance to know of every case in which a choroid detached so as to exhibit the ophthalmological appearances of tumour has been proved by the microscope to contain no new growth. I am glad to see a paper on this subject on the agenda for this evening.

Amongst rare diseases of the fundus we want further contributions on the following :—*A Peculiar Case of Retina*, and of Central Nervous System in Infants, described by Mr. Tay in vol. i., p. 55. vol iv., p. 158, and vol. ii., 126 ; and more exhaustively by Mr. Kingdon in vol. xii., 126. Particular attention might be given to the question of consanguinity ; the origin and mode of formation of the "angioid streaks," or scar-lines, between retina and choroid, figured by Mr. Stephenson in our twelfth volume ; all cases of permanent, presumably *congenital night-blindness without visible ophthalmoscopic changes*, such as described by

Mr. Morton in vol. xiii.; and all cases with the same symptoms, but stationary in spite of the presence of visible changes.

Cases are still wanted in which there is proof of *amblyopia* or of disease of optic nerves *caused by alcohol* in persons, male or female, who do not smoke. Has anyone, since the discussion on toxic amblyopia here in 1887 (vol. vii.), seen cases in which tobacco could be absolutely excluded?

Mr. Snell, in vols. v. and xiii., has given three cases, and referred to a few others previously published, in which temporary *paralysis of the third nerve accompanies an attack of one-sided sick-headache*. These cases are extremely puzzling. Perhaps when a much larger number have been recorded we may find that some at any rate are due to coarse disease involving the nerve.

Amongst subjects more or less suitable for elucidation by collective work may be mentioned the relative merits of *removal of the eyeball*, and of *evisceration*, with or without insertion of a glass or metal globe into the sclerotic. Sufficient material could probably now be collected to allow the formation of a final opinion on the advantages of each of these operations in regard to : (1) immunity from danger of meningitis; (2) immunity from danger of sympathetic disease; (3) rate and ease of recovery after operation; (4) comfort and mobility of the artificial eye.

The disease called "*pemphigus*," or "*essential shrinking of the conjunctiva*" might also, I would suggest, be fruitfully investigated and reported upon by a Committee. The conjunctival disease is, without doubt, often associated with the occurrence of blebs in the mouth, or with chronic disease of the nasal mucous membrane, or with bullous and vesicular eruptions on the skin. It is noteworthy that the skin eruption sometimes leaves scars, which is not, I believe, the case in ordinary pemphigus (see Mr. Cross's case, vol. xii., 61). Is this very peculiar disease of the conjunctiva ever associated with true pemphigus? We should need help from dermatologists in reporting effectively on this subject.

Rare cases have been seen and published from time to

time under the title "*chronic diphtheritic*," or "*chronic membranous*" *conjunctivitis*. Some of them are most remarkable. Perhaps they might be reduced to order and fresh cases added by the labours of a Committee, with especial reference to their connection, if any, with diphtheria.

I think there is room for a discussion between physicians and ophthalmic surgeons in the study of the cases commonly called *retro-bulbar neuritis*. This term unquestionably includes more than one form of acute inflammation of the extra-cranial part of the optic nerve or nerves, and it is important to discriminate, when possible, between the cases indicative of, or associated with, disseminated sclerosis, and others due to causes purely local from beginning to end.

The present state of opinion on the respective merits of *tentotomy and advancement* for concomitant convergent squint might perhaps be an interesting subject for a purely ophthalmic discussion.

The relative value of the various *strong local remedies for serious ulcers of the cornea* is full of practical bearings. Not admitting of precise statement or statistical treatment, we should, nevertheless, I believe, assist each other much by expressions of opinion and by narrating our experiences.

Observation has of late been much directed, both abroad and here, to the minute clinical varieties of *superficial keratitis*, and this field is evidently a fruitful one for research and contributions.

Two forms of ulcer seem also to need especial study—the so-called dendritic ulcer, and another form, which in my experience is rare, of extremely chronic, moderately deep, areolar, creeping ulcer, which runs a course, not of days or weeks, but of many months, eating off perhaps half the thickness of the cornea, and not stopping so long as any part of the corneal surface remains healthy; not perforating, and never accompanied by hypopyon.

There is room for further work as to the relations, if any, between chronic *trachoma*, so-called acute trachoma, *follicular conjunctivitis*, and "*spring catarrh*;" and particularly on the connexion, if there be any, between the two latter

affections of the conjunctiva, and chronic hypertrophic affections of the tonsils and of the naso-pharynx.

If chronic trachoma is so very contagious, can anyone explain the cases, not so very rare, in which the disease is limited for years to the lids of one eye? Mr. Ridley, as the result of his own histological examination, suggests that the *contagium* may be a parasitic protozoon (vol. xiv., p 32).

Chronic irido-cyclitis, or cyclo-iritis, with keratitis punctata, is most frequent in young women and in women at about the climacteric. It is not enough to say that the disease is due to generally enfeebled health. Upon what form or forms of blood impurity from internal absorption, defective assimilation or faulty elimination, does the disease depend? And why does the constitutional state so often select the peculiar structures described by Mr. Treacher Collins and Nicati as glands in the ciliary body?

What are the facts as to the occurrence of *iritis*, of any form, as a *consequence of late syphilis*? Opinions differ; the point should be capable of settlement without difficulty if we keep close to facts and refuse to be satisfied by pre-conceptions.

We have lately been hearing a good deal about deep *tubercle* of the eye, of the iris especially. What criteria are we to employ in the diagnosis? How often does tubercle of iris end in retrogression (not necessarily true recovery)?

Observations are wanted in support of the suggestion that certain cases of solitary large choroidal exudation, followed by absorption and unaccompanied by general complications, are tubercular.

A form of *acute disseminated choroiditis*, not usually associated with retinitis, is sometimes seen in young adults, running a fairly quick course, leaving scars, and not recurring. It differs from ordinary syphilitic choroiditis in leaving the retina free, in not usually leading to full atrophy of the choroid, and often in the irregular map-like outline of the spots. The patients, so far as I have observed, do not show signs of hereditary syphilis, and the affection occurs at a later age than is common in that

disease ; whilst in many of the cases it is exceedingly unlikely that syphilis has been acquired. The cases have of course often been spoken about ; it should be possible to clear up the question of causation as regards syphilis.

We still, I believe, want microscopical examination and explanation of the appearances in *Tay's choroiditis* and in other senile forms, and of the changes in certain cases of very severe central choroiditis, when, in spite of the grossest ophthalmoscopical changes in the choroid, the function of the retina is good.

In regard to *affections of the retina*, there is room for further study of the clinical and pathological varieties of disease of the retina, and especially of the retinal vessels, not associated with diabetes, recognisable organic disease of kidneys, or other morbid blood states.

The importance of the study of *defects in development of intra-uterine disease*, and of *congenital and hereditary liabilities* for the interpretation of various morbid conditions of the eye, requires no emphasis at the present day. Our *Transactions* contain many most valuable papers and cases in point, and much more remains to be done. Amongst others that occur to me are the variations in muscularity of the iris as shown in its varying behaviour to mydriatics, especially in children ; and the want of accurate correspondence in cases of partial albinism, between the amblyopia and the nystagmus on the one hand, and the degree of pigment defect on the other ; so that it is possible to have almost complete albinism with good sight, and very slight apparent want of pigment with considerable amblyopia. Reference may also be made to the extraordinary degrees of tortuosity not very rarely met with in the retinal veins. Several instances have been published in our earlier volumes : the condition may affect veins alone or arteries alone, or both sets of vessels. Has any relation been traced between this abnormality and liability to headache ? Are such tortuous vessels without disease ever seen except in young persons ? Does the haze and swelling of optic disc so commonly seen in hypermetropic children persist through life ?

There is evidently much still to be done in discriminating between the various kinds of *intra-ocular tumour*, as is shown by Mr. Treacher Collins' case of probable glioma of retina in an old woman (vol. xii.), and of glandular tumour of ciliary body (vol. xiv.) and Mr. John Griffiths' case of carcinoma of the pigmented epithelium (vol. xiv.), and many others.

The subject of *tumours*, whether symmetrical or unilateral, in the region of the *lacrymal gland*, and that of pulsating exophthalmos, are also amongst those to which members of this Society have made several important contributions, and which will repay further study.

Four Cases of Bilateral Glioma of the Retina cured by Enucleation of the Two Eyes.—This paper was read by Mr. Treacher Collins. He first referred to the paper in which Mr. Lawford and he had shown that there was no authentic record of a case in which a gliomatous growth had recurred later than three years after enucleation of an eye for that disease. He related histories of the following four cases :—

CASE I.—A boy who had his right eye excised for glioma when 5 months old, and his left eye three years later. Three and a-half years after the removal of his second eye he was alive and well, and there was no sign of any recurrence.

CASE II.—A girl whose left eye was excised for glioma when 5 months old, and right eye nine months later. She was seen to be in perfect health four years and seven months after the removal of the second eye.

CASE III.—A girl whose left eye was excised for glioma when 10 months old, and right eye thirteen months later. Four years after removal of the second eye she was in good health, and there was no sign of any recurrence.

CASE IV.—A boy, both of whose eyes were excised for glioma when he was 1 year and 4 months old, the left being a shrunken one. Three years and three months later he was in good health, and had no sign of any recurrence.

Seeing that all these four patients were alive and in good health, without any sign of recurrence, after an interval of more than three years from the date of removal of the second eye—that is, after the longest interval at which there is any authentic record of a recurrence having occurred—he thought he might justly claim that they were cured.

Mr. Lang had had three cases, two of which were described by Mr. Collins; in the third case one eye was excised at 15 months of age; the growth was discovered in the second eye nine months later. The parents refused to have the eye excised, but it was excised later on account of pain. There was then a secondary nodule in the neck. The child did not die till it was 8 years of age.

Mr. Lawford quoted a case in which the first eye was excised at the age of 2 months; two years and a-half later the second eye was affected. The parents refused to have the eye removed till three years after, when the nerve was involved.

Mr. Priestley Smith had seen a child in a blind institution who was said to have had both eyes removed for “cancer” in infancy; it was probably glioma.

The President had had another case besides those quoted by Mr. Collins, in which both eyes were excised before 1892, and the boy was still in good health.

Detachment of Choroid.—Mr. C. Devereux Marshall read this paper. Three cases had recently come under his notice. The first was in the eye of a lad aged 20, who suffered from glaucoma. Iridectomy was performed, and three days later the eye became very painful, owing to a large hæmorrhage having taken place beneath the choroid. On examining it after removal the choroid and retina were completely detached. The second case was that of a man aged 60, who had suffered from glaucoma. Iridectomy was done, but the eye shrank and was removed. There was an extensive detachment of retina and choroid, the sub-choroidal space was filled with new tissue, in which cyst-like spaces were developed. Microscopic examination

proved it to be the much thickened lamina suprachoroidea and lamina fusca; the small spaces contained pigment and were probably lymph channels. The third case was that of a man aged 68, who had a cataract extracted; $V. = \frac{6}{12}$ and J. 1 afterwards, but six months later his sight failed. As it was feared that the eye contained a new growth it was removed. There was almost complete detachment of choroid and retina; the only place where the coats remained attached to the sclerotic were at the places where the vessels and nerves penetrated; thus there were four large balloon-shaped detachments, the sub-choroidal space containing nothing but serous exudation. The first case is similar to that condition met with after an accident resulting in the loss of a large quantity of vitreous, and it is occasionally seen after cataract extraction, but here the hæmorrhage probably did not come on for three days after the operation, and there was no loss of vitreous. The last case is the most uncommon. The detachment probably came about as the result of (*a*) hyalitis leading to shrinking of the vitreous: (*b*) choroido-retinitis: (*c*) serous exudation poured out between choroid and sclerotic. The diagnosis previous to removal is most difficult. The tension is usually diminished, and this is the most distinctive feature between the simple detachment and that due to a growth.

Mr. Jessop asked if there had been any cases recorded in which there was diminished tension with an intra-ocular tumour.

The President wished to know if there were on record cases in which a simple detachment of the choroid had been diagnosed during life. He thought it was not very uncommon to get diminished tension in the very earliest stages of intra-ocular tumour.

Mr. Priestley Smith and Mr. Treacher Collins had both looked for cases of intra-ocular tumour with diminished tension without success.

Card Specimens.—The following were the card specimens:—Mr. Ernest Clarke: (1) Rare form of Nystagmus; (2) Orbital Tumour.—Dr. Mott and Mr. Treacher Collins:

Case of Exophthalmos with Trigeminal Hemianalgesia.—
Mr. Kenneth Campbell : Case of Anophthalmos.—Mr. A.
S. Morton : Snellen's Operation for Symblepharon.—Mr.
Higgins: Unusual form of Conjunctivitis.—Mr. Lawford :
Case of Retinitis Circinata.

ALFRED GRAEFE. The Neuropathic Nature of Nystagmus. *Von Graefe's Arch.*, xli., 3, p. 123.

The two groups into which all cases of nystagmus have hitherto been divided, viz., those of the congenital, or more correctly infantile, and those of the acquired malady, have been considered to have a totally different etiology. Strictly speaking, only those cases can be termed congenital in which there is no doubt as to the dependence of the symptoms on congenital anomalies in the nervous system, since defective vision as the cause of nystagmus can of necessity show its influence only some time after birth.

In all these "congenital" cases—for convenience' sake the term may be retained--vision is defective, and often more so in one eye than in the other owing to opacities in the refractive media, malformations, albinism, remains of foetal affections, high degrees of ametropia, and colour-blindness.

Graefe points out that for the few cases in which we find normal, or almost normal, vision, probably pathological processes, healed afterwards, have existed in that early period of life which is susceptible to the development of nystagmus. As one of these causes he mentions particularly retinal hæmorrhages occurring during birth especially in prematurely born children.

[According to observations in Halle made on 130 cases, every third showed retinal hæmorrhages, every fifth the same to a high degree.]

This group of cases of "optical" nystagmus in the causation of which defective vision plays the most prominent part, is markedly different from those of acquired nystagmus in so far that in the latter no such

defective vision can be made responsible for its occurrence; its cause is extra-ocular, it is a neuropathy.

Experimentally nystagmus has been produced by Hitzig by the application of galvanic currents through the back of the head, whereby the direct excitation of the corresponding eye muscles and their nerves was carefully avoided, while Raehlmann has collected a number of pathological cases in which nystagmus was found to be associated with morbid affections of the corpus striatum, the corpora restiformia and corpora quadrigemina, the fourth ventricle and the cerebellum. Raehlmann tries to prove that the etiology is the same both for the optical and the acquired nystagmus. He considers the affection which caused the defective vision and the nystagmus (the anomaly of movements) as two independent and different manifestations of the same neuropathic cause; hence both optical and acquired nystagmus would have to be regarded as neuropathies.

As for the etiology of the optical nystagmus, Graefe refers to what he said twenty years ago (Graefe, "Saemisch," vol. vi.) that "its origin is caused by a hindering of the functions of the retina at a time when these have to exercise a directing and regulating influence over the training of the normal fixing position of the eyes"; and he is quite aware that he gives in this sentence only an observation, not an explanation.

The similarity between the nystagmic movements and the tremor of other muscles due to central affections is indeed striking. There is this however to be noted, that while the typical "congenital" nystagmus is more or less continuous, the acquired nystagmus is only occasioned at intervals, and mostly by special causes, *e.g.*, miner's nystagmus; and further, that in congenital nystagmus the voluntary movements of the eye in convergence and laterally and vertically are quite unhindered, which is not the case in the acquired form.

Graefe points out that certainly in a great number of cases of congenital nystagmus complications such as anomalies in the development of the cranium and in the

brain occur, and here we are almost forced to the assumption of the neuropathic etiology of the condition. Such an explanation, however, becomes more doubtful in the equally numerous instances where we can only find the residuum of an affection which has impaired nothing but the acuity of vision.

Still less can the neuropathic theory be held to account for those not unfrequent cases in which nystagmus is developed under the influence of corneal opacities after blennorrhœa neonatorum.

The way in which Graefe tries to meet the difficulties of a more uniform explanation is as follows:—

In consequence of the existing defects of vision the light-perceiving parts of the cerebrum receive only subnormal stimuli which in their turn lead again to subnormal (= insufficient) excitations of the centres which regulate the movements of the eyes. These subnormal excitations in the centres lead there to changes whose functional expressions are the involuntary tremor-like movements.

It is probable that the earliest period of life is the most favourable for this process. According to this view the defect of vision is the primary cause of the affection of the motor centres which becomes permanent in consequence of continued occurrence.

In this sense nystagmus may be called neuropathic. But while according to Ræhlmann the pre-existing neuropathic lesion is the cause of the nystagmus, Graefe considers the anomaly of the motor centres to be an effect which in its turn produces the nystagmus.

In this way an insight might also be obtained into the acquired nystagmus in miners, where the eyesight is put to a great strain by the feeble illumination or indistinctness of the retinal images.

At the conclusion of this very interesting paper Graefe mentions the relation of the ocular movements to the apparent locomotion of the visual field which is not perceived in congenital nystagmus but is perceived in the acquired form where it forms the most disagreeable subjective symptom.

In this connection the author makes a most extraordinary statement. Trying—and failing—to make nystagmus patients (with good vision) perceive the movements of their own eyes by means of a mirror, Graefe makes the following assertion printed in leaded type: “We are altogether incapable, even under normal conditions, of seeing the movements of our eyes in the mirror. This was for a long time as unknown to me as to those *confrères* whom I questioned about this point.” In proof thereof the experiment of looking binocularly into a mirror at one’s own eyes alternately, is given and fully explained by a diagram. How such a past master in the art of analysing the movements of the eye could have fallen into this trap it is difficult to understand, considering that the experiment he adduces is almost the only exception to our ability of seeing the movements of our own eyes in the mirror. Only one or two experiments in corroboration of this may be given, although it is hardly necessary:

To observe the movement of the same or the other eye, either monocularly or binocularly, take a mirror, and while looking at the image of one of your eyes, move the mirror up and down, or right and left, tilting it sufficiently to keep the line of vision perpendicular to the plane of the mirror.

Or, keep the mirror fixed and move the head up and down, right and left, while looking at the image of one of your eyes. By this method it is equally easy to see the movements of the eyes excentrically by looking at the image of some other part of one’s face, *e.g.*, the bridge of the nose, the forehead, the eyebrows, &c. With lenses and prisms, movements can also be made noticeable in the mirror:—*quandoque bonus dormitat Homerus*.

K. G.

PERGENS (Brussels). Phlegmonous Inflammation
of the Orbit, a Complication of Influenza.
Annales d'Oculistique, October, 1895.

The author publishes reports of three cases of orbital cellulitis occurring during attacks of influenza; in all three suppuration took place; in two the disease proved fatal, and in one of these a *post-mortem* examination was made.

CASE I.—A boy, aged 14 years, ill for six days when first seen. The illness began with severe headache, followed by marked prostration. The general aspect of the patient was that of pronounced fever; the temperature was 39.7° C., respiration 42, pulse 136. The eyelids were greatly swollen, the swelling having appeared on the left side on the fourth day, and five or six hours later on the right.

The appearances resembled those of a very severe blennorrhœa of the conjunctiva; the swelling on the left side being much greater than on the right. Conjunctival secretion was scanty. Microscopic examination proved the absence of gonococci; inspection of the genitals showed that there was no gonorrhœa. Palpation of the lids was very painful. The conjunctiva of the right eye was chemosed, the cornea transparent, iris of normal colour and reacting well to light; movements of the globe were abolished. The conditions in the left eye were similar, except that the movements of the globe were not wholly lost; the eye was divergent, and this strabismus had not existed previously. Ophthalmoscopic examination was impossible; the patient could see to read newspaper type with either eye.

Two days later the right eyelids were less swollen; on the left side the swelling was no less, but the upper lid had become livid, and fluctuation was evident. An incision was made and about 30 cubic centimetres of pus evacuated; a probe passed deeply into the orbit, but no carious or denuded bone was discovered. On examination the pus removed from the orbit was found to contain Friedlander's

pneumococcus and staphylococcus pyogenes aureus. The right eye regained its normal condition on the eleventh day of the illness; on the left side the swelling diminished considerably, and a certain degree of movement of the eye was recovered. The patient died on the twelfth day, with high fever, 41.6° C. Permission for an autopsy was refused.

CASE II.—Male, aged 19 years, first seen on the ninth day of his illness. He was apathetic, and could with difficulty be induced to reply to questions. Temperature was 38.4° C., respiration 36, pulse 118. The eyelids on the right side were greatly swollen, hard and tense. On the left side the upper lid was livid, and fluctuation could be felt through it; the lower lid was not indurated. Two exploratory incisions were made through the lids of the right eye into the orbit, but no pus was obtained. An incision through the left lower eyelid gave vent to some pus. Cultures from this showed a growth of staphylococcus pyogenes albus and aureus.

The corneæ were transparent; the conjunctivæ chemosed; the pupils reacted to light; movements of the eyes were almost entirely abolished. The fundus of the right eye was normal; in the left there was optic papillitis, but without affection of sight. The patient could read Sn. 0.5.

Through an incision in the left lower lid about ten cubic centimetres of pus escaped; a probe passed behind the globe discovered some carious bone, apparently part of the ethmoid and superior maxilla. Another incision in the upper lid, below the eyebrow, gave exit to about 15 cc. of pus; through this opening, however, no bare bone could be felt. There was some discharge of pus from the left nostril.

On the twelfth day of the disease the lids of the right eye became more swollen, and fluctuation was then evident; incisions were made similar to those on the left side. The next day pus escaped from both nostrils. Both corneæ became cloudy, the patient suffered great pain, and his general condition got worse. The following day there was bi-lateral panophthalmitis; temperature varied from 41.4° C. to 42.1° C., and death occurred in the evening.

The *post-mortem* examination showed that perforation of both corneæ had occurred, and that each globe was filled with pus. On the left side there was caries of the ethmoidal and maxillary walls of the orbit, in connection with the abscess opened through the lower lid. The upper abscess previously mentioned had not involved any bony structures. On the right side no carious bone was found, but a large abscess occupied almost the entire orbit.

There was phlebitis of the superior and inferior ophthalmic vein on each side, and also of the cavernous, coronary (circular) and petrosal sinuses, which were filled with blood and pus. The frontal sinus and the ethmoidal cells on both sides were full of pus. The left maxillary sinus was two-thirds full of pus, while the right antrum appeared to be normal. The sphenoidal sinuses were filled with purulent material. At the base of the brain there was abundant purulent exudation, and in the left frontal lobe several small abscesses. The cerebral ventricles were free from any abnormality.

CASE III.—Female, aged 28, came under observation two weeks after an attack of influenza, by which she was confined to bed for six days. On the fourth day of her illness her left eyelid became much swollen, and she suffered great pain in the orbital region. An abscess formed, which was opened in two places, below the centre of the lower lid and near the inner canthus. When seen by the author there was suppuration in the lacrymal sac, and a fistulous opening which led from the middle of the lower lid towards the temporal side of the orbit, and extended into the cellular tissue a distance of 12 mm. There was no evidence of disease in the frontal or maxillary sinuses.

Cultures from the pus in the abscesses demonstrated the presence of *staphylococcus pyogenes albus* and the *bacillus cyaneus*. The abscess disappeared under treatment, but a dextritic keratitis left a slight permanent opacity of the cornea.

Pergens' cases all occurred during the prevalence of influenza; microscopic and bacteriological examination ex-

cluded a blennorrhœal source of infection. Thinking that, in spite of the non-extension of the inflammation from the eyelids to the adjoining skin, the condition might be erysipelalous, the author inoculated some mice, but the results wholly negatived erysipelas. He was unable to satisfy himself as to the source or mode of entrance of the microbes. In no one of the patients had there been previously conjunctivitis, dacrocystitis, ozæna or affection of any cranial cavities.

In the first case the author thinks death was probably not due to meningitis, for the symptoms of this complication had subsided. In the second case it was impossible to exclude absolutely some pre-existing disease in one of the sinuses, and he is inclined to consider that suppuration began in the ethmoidal cells on the left side. J. B. L.

BENTZEN and LEBER (Heidelberg). On Filtration from the Anterior Chamber in Normal and Glaucomatous Eyes. *Von Graefe's Archiv*, vol. xli., part 3, p. 209, 1895.

In 1881, Leber reported some experiments which showed that fluid injected into the anterior chamber of an excised eye, escapes with much greater difficulty in the case of eyes blinded by glaucoma than in the case of normal eyes. At the International Ophthalmic Congress of 1888, he stated that having made further experiments of the same kind he had met with no single example either of secondary or of primary glaucoma in which this retardation of filtration was not well marked. He estimated the escape of the fluid partly by the colouration or non-colouration of the ciliary plexus by the coloured fluid, partly by the fall of the column of fluid in the manometer, but the method of the experiment was not adapted specially for measuring the amount.

Bentzen has lately taken up the subject again, making further experiments, and using an apparatus similar to that employed by Priestley Smith (see OPTHALMIC REVIEW, 1888, p. 199). The list of cases he publishes includes several of the earlier ones of Leber. A summary of results can hardly be given, inasmuch as the method was not the same in all cases. It has to be borne in mind, moreover, that the measurements obtained even by the best method have only an approximate value, for the quantity of fluid which passes through the injection apparatus does not exactly represent that which passes through the eye, a certain portion of it being employed at first in restoring the normal fulness of the eye. Moreover, the rate of filtration as a rule steadily diminishes throughout the period of the experiment, probably because of changes in the tissues, and is also dependent on temperature. Making due allowance for the uncertainty arising from these sources, the results have still a very clear significance.

In the case of the normal eye of a female subject, aged 45, injected thirteen hours after death with a 0.75 per cent. solution of common salt under a pressure of 25 mm. of mercury, the escape per minute was 5.0 cub. mm. In the case of the two eyes of an aged male subject injected two hours after death, the one with a 20 per cent. solution of acid-fuchsin, the other with solution of Berlin-blue, the escape was 2 cub. mm., and 1.3 cub. mm. per minute, respectively.

Four eyes blinded by primary glaucoma were tested by injection, and subsequently, after hardening and division, were microscopically examined. The first, a case of chronic inflammatory glaucoma iridectomised without relief, injected with Berlin-blue, showed no trace of injection of the ciliary vessels. The escape, if any, could not be measured. The iris periphery was everywhere in contact with the cornea but easily separable from it. The coloured fluid had nowhere reached the angle of the chamber or Schlemm's canal. The second, a case of chronic absolute glaucoma, probably at first simple,

injected with Berlin-blue, showed no trace of ciliary injection. Here, as in the preceding case, the method of the experiment did not permit of measurement of the escape, if any. The angle of the chamber was found closed throughout half the circle, more or less open throughout the remainder, and where open was filled with blue colouring fluid. The tissue surrounding the angle of the chamber was thickened. None of the colour had found its way into Schlemm's canal, which was filled with blood. The third, a case of absolute glaucoma, probably acute at the outset, injected three hours after enucleation with a mixed solution of Berlin-blue and carmine, showed no trace of ciliary injection. The escape as indicated by the apparatus was 0.4 cub. mm. per minute. The fourth eye, of the same nature as the last, injected by means of the improved apparatus, with the salt solution, under a pressure of 25 mm. of mercury showed an escape of 0.19 cub. mm. per minute. The filtration angle was everywhere closed.

Two eyes affected with what the author calls *hydropthalmus anterior*—one being a case of secondary glaucoma with ectatic cornea and deep anterior chamber following inflammation in childhood; the other a case of congenital *kerato-globus*, were similarly tested. The former showed an escape of 0.4 cub. mm. per minute. It was not examined microscopically. The other showed an escape of 0.18 cub. mm. per minute. The angle of the chamber was widely open but impervious, for the fluid had nowhere found its way into the ciliary venous circle (Schlemm's canal). These vessels of the latter were imperfectly developed, and in some sections not to be found.

Six other eyes, classed as secondary glaucoma, were injected in the same way. It is unnecessary to give the details. In every case the escape was smaller than that obtained by a similar injection on a normal eye, the difference, in every case but one, being very great.

P. S.

E. FABER (Hague). The Operative Treatment of Astigmatism. *Centralblatt f. prakt. Augenheilk.*, Sept., 1895, p. 262.

Faber relates the case of a young man aged 19, who on account of the vision of his right eye was rejected from military service. Vision in that eye was $\frac{4}{10}$. After correcting the anomaly of refraction (spher. — 0.75 combined with cyl. + 1.5, axis 60° temporally) vision could be brought up to $\frac{4}{5}$, but on account of the military service it was desirable that the vision should be improved without the help of glasses if possible.

For this reason Faber resolved to carry out the idea already suggested by others, of reducing the curvature of the meridian of strongest refraction by means of an operation. The observed flattening of the cornea in the direction of the wound in iridectomies and after cataract extractions served to indicate the *modus operandi*. By means of a keratome an incision 6 mm. in length was made in the corneo-sclerotic margin in the meridian 60° temp., the eye was treated antiseptically, the pupil kept contracted by pilocarpine, and the wound healed without the slightest irritation.

Seventeen days afterwards the refraction had changed to hypermetropic astigmatism + 0.75 (30° temp.) Vision without glass = $\frac{6}{8}$, after correction = $\frac{5}{6}$. Owing to the increase of vision the patient was able to pass the military standard on the following day (18th), and was accepted. The astigmatism had been reduced from + 1.5 to + 0.75, and the meridian of strongest refraction had been moved from 60° temp. to 30° temp.

The author concludes that this case is a practical proof of the theoretical assumption that astigmatism, and especially myopic astigmatism, is amenable to operative treatment. It is true he admits the difficulty of obtaining any definite amount of flattening of the cornea, but when he thinks himself entitled, from the result obtained in this instance, to recommend the operation for similar cases, we may well pause before accepting this recommendation unreservedly.

To begin with, generalisations from a single case must always be received with caution, be the result ever so brilliant. But this particular case in question is open to special objections of its own.

It is well known that the astigmatism that follows the extraction of cataract, changes gradually for several months after the operation, till the curvature of the cornea finally becomes stationary. In this particular case only seventeen days were allowed to elapse (from July 30 to August 16), and the result obtained then has practically been taken as permanent. From the present writer's experience it is almost certain that two or three months later the result would be found different, and in this particular instance most probably less satisfactory than that obtained on the seventeenth day.

Furthermore, even after operation a certain amount of astigmatism remained, and vision could be improved by a proper glass, so that for getting the maximum vision a glass was required after all—except for passing that particular military standard.

After all, the opening of the anterior chamber, and the incision of the cornea to the extent of at least six mm., is an operation which involves serious risks from possible prolapse of the iris, infection of the wound, &c. If, then, after such an operation, a glass is still required to bring up the vision to the possible maximum, it is more than doubtful whether ophthalmologists generally will accept the responsibility of such risks, when without any operation at all, and therefore without any danger whatever, properly selected glasses alone are quite sufficient.

K. G.

T. THEODOROFF (Moscow). The Follicular Glands (so-called Manz's) in the Normal Human Conjunctiva. Preliminary Communication. *Centralblatt f. prakt. Augenh.*, September, 1895, p. 257.

The follicular glands found by Manz in 1859, in the conjunctiva of the pig, were soon afterwards described by Stromeyer under the title of Manz's glands, as present in the conjunctiva of various animals, and also in man. Henle also found them in the human conjunctiva, but after him no one, not even Manz himself, could discover them there, so that their very existence became doubtful, or was altogether denied.

Theodoroff has been able to verify the fact of their occurrence in man, not as the "nest-like agglomeration of epithelial cells in a pocket of connective tissue in the conjunctiva" as Waldeyer interpreted them, but quite in accordance with the accurate descriptions given by Manz and Stromeyer. Theodoroff's method of examining was a preliminary inspection of the fresh conjunctiva spread out as flat as possible and stained with some nucleophile staining fluid, such as hæmatoxyline. By this method Theodoroff found the glands in the adult as well as in children of every age, in the new born and even in the fœtus of seven and eight months.

The glands appear as round, sometimes oval, bodies, well differentiated by the stain from the surrounding tissue. The periphery, deeper stained than the centre, shows radiate lines. In the centre of the round bodies is seen a sharply defined oval opening of a brilliant white, while in the oval bodies this opening is situated near the periphery. These glands, of various size, are often grouped in pairs, and are found in all parts of the conjunctiva, but mainly in the tarsal portion, while they are very rare near the cornea; they number generally from eighteen to thirty in each lid.

In transverse sections they appear as a pocket-shaped recess in the conjunctival tissue immediately underneath

the epithelium; the cavity of the pocket opens through a narrow neck with an opening on the epithelial surface. Both neck and pocket are formed by a hyaloid membrane lined with a compound cylindrical epithelium; the cavity of the pocket and neck and opening is filled with a mass of free cells and detritus. The main direction of these glands is perpendicular to the surface of the conjunctiva.

Considering the comparatively large number of these glands, their superficial position, and their excretory activity, Theodoroff has no hesitation in ascribing to them an important role in the pathology of the conjunctiva, and promises to give in a subsequent paper the proof thereof by a histological account of pathological cases.

K. G.

W. LANG (London). *The Methodical Examination of the Eye.* London: Longmans, Green & Co., 1895.

This is a small, well-printed, and well-illustrated book, suitable for use in the ophthalmic out-patient room. It is announced as the first part of a guide to the practice of ophthalmology for students and practitioners. It consists of four chapters, the first of which is a brief statement of the purpose and routine of a methodical examination of the eye. The rest of the book deals successively with the external examination, the examination of the vision, and the ophthalmoscopic examination. We notice here and there a point to which exception might be taken by one or other practical ophthalmologist, for example, the absence of any mention of the ophthalmometer of Javal and Schiötz, of Masson's disc, of methods of measuring the angle of a strabismus other than that requiring the use of the perimeter, &c., and here and there a method is advocated as

part of a routine examination, which by some surgeons is rarely if ever employed, but, remembering the difficulty of dealing with so complex a subject effectively, and within so small a space, we have no hesitation in saying that the author has accomplished his object well, and produced what is likely to prove a very useful little book.

A. TROUSSEAU. Interstitial Keratitis in Acquired Syphilis. *Annales d'Oculistique*, September, 1895.

TRANTAS (Constantinople). Case of Interstitial Keratitis not due to Hereditary Syphilis. *Archives d'Ophthalmologie*, November, 1895.

Trousseau draws attention to the fact that, though modern authors of ophthalmological literature are beginning to recognise the existence of a form of interstitial keratitis dependent on acquired syphilis—a variety which has, up till now, been for the most part passed by in silence—they have not laid down any precise features by which the disease may be diagnosed. One of the arguments of those who oppose, or used to oppose, the now well-established theory of close relation between interstitial keratitis and hereditary syphilis, was the fact that acquired syphilis never affected the cornea. Trousseau doubts, indeed, whether the affection is so rare in acquired syphilis as even those who admit its occasional existence consider it to be, and thinks it probable that some of the cases ascribed to gout, rheumatism, &c., are in reality of luetic origin.

The disease is more frequent in women than in men apparently, just as is the case in regard to the sexes in the hereditary form; but it contrasts with the hereditary in this, that it is almost always unilateral: recurrences,

moreover, appear to be less frequent. The time of onset is after the first and before the beginning of the third year from the time of infection, and at the period of its commencement, other syphilitic manifestations are not infrequent, but sometimes the patients are apparently in the enjoyment of perfect health.

The onset is insidious, the cornea becoming slowly more opaque, and no marked inflammatory reaction being present at that time. He has never seen that distressing photophobia, intense lacrymation, and active congestion which are so frequently met with in the hereditary disease. The cornea either does not become vascularised at all, or only slightly, and that at the margin: the duration is much shorter than in the other form, and *restitutio ad integrum* is more frequently realised. The iris always participates to a pretty high degree, and the vitreous humour becomes filled with the well-known dust-like opacities; choroiditis is a frequent concomitant. The hyalitis is often the last of the phenomena to disappear, persisting as it sometimes does for a considerable time after the cornea has recovered its transparency. Mercurial treatment acts like a charm (*"merveilleusement"*) upon the corneal lesion, and under its influence improvement can be observed to be going on almost from day to day—a much more marked result than one obtains in the hereditary form, though in it also, as Trousseau believes, the mercurial treatment is decidedly beneficial.

He has lately had under his care the very interesting case of a boy, aged 8 years, who, having become infected by his nurse, has acquired syphilis, and has suffered from interstitial keratitis in both eyes, of a very severe type and of long duration. If the reason of the comparative mildness of the usual cases of interstitial keratitis in acquired syphilis were the adult age of the patient (and the severity of this particular case, on the other hand, were due to the youth of the patient), then one would expect, by analogy, that hereditary interstitial keratitis in the adult would be benign also; but is this so? If not, then one must fall back upon the supposition that the juvenile corneal tissue is less resistant to the syphilitic virus.

Trantas observes that there are extant three opinions in regard to the etiology of interstitial keratitis: (1) that it is always due to hereditary syphilis (Hutchinson); (2) that it is syphilitic, whether hereditary or acquired; (3) that it is, in the great majority of cases, due to hereditary syphilis, less frequently to acquired syphilis, and occasionally to other causes—*e.g.*, malaria (Poncet, Javal). It is to be noted also that even those who admit the occurrence of interstitial keratitis in acquired syphilis are not quite in accord as to whether the disease produces the keratitis directly or indirectly by causing a uveitis—whether the keratitis, that is to say, is primary or secondary.

Trantas relates, at some length, a case of his own occurring in a man of 53, who had acquired syphilis 13 years previously. This is the longest period known to have elapsed between chancre and keratitis.

W. G. SYM.

H. COPPEZ, FILS (Brussels). Six Cases of Osteoma of the Frontal Sinus. *Archives d'Ophtalmol*, May, 1895.

Whether or not it is advisable to remove orbital exostoses is one of the questions in ophthalmology which still provokes much discussion.

Some operators, basing their opinion on a series of favourable results, regard extirpation of the growth as the orthodox method of treatment. The operation, they say, not only lessens disfigurement but saves the sight, and in some cases also the patient's life, by preventing encroachment of the growth into the cranial cavity.

Others who have been less fortunate in their results are

more guarded. They urge that the dangers and difficulties of operation are often greater than they at first appear, *e.g.*, the growth may have perforated the posterior wall of the sinus and formed firm adhesions to the dura mater without having given any sign of this serious complication.

Again, some surgeons are sceptical as to the benefit gained by interference. The disease itself, they contend, is often not very serious, and an attempt to cure it may not only fail but may, and sometimes does, result in the establishment of a permanent fistula, which occasions much more trouble than the original malady. The only satisfactory way of settling the question would be to collect and tabulate the results—immediate and final—of cases operated on under strict antiseptic precautions, and to compare with them a sufficient number of cases which have been allowed to run their natural course.

Six cases which have come under the author's own observation are here recorded. Five of them have been operated on and for the most part have been kept under observation for a long time—three, five and ten years. One has refused to allow any operation, and it is interesting to compare his condition with that of the others.

Case 1 is that of a young man, aged 20, who attended Professor Coppez' clinic for the first time on August 5, 1885. For the last year and a half, he said, the right upper lid had been swelled and red. The eye was slightly pushed forwards, the upper lid tense and congested, and when raised revealed a hard tumour in the orbit. There was an occasional muco-purulent discharge, moderate in amount, from the right nostril, and frontal headaches were severe. The diagnosis was osteoma of the frontal sinus. Vision of the right eye was $\frac{1}{3}$, that of the left normal. Ophthalmoscopic signs of the disease were absent.

For more than a month the patient was treated with mercurial inunctions and iodide of potassium, but without any improvement.

On September 15, an operation was undertaken with a

view to removing the growth if that were possible. On opening the anterior wall of the frontal sinus, it was easy to see that the mucous membrane showed signs of violent inflammation. The tumour had penetrated far into the depth of the cavity and looked as though it might have passed within the cranium. It was therefore determined to remove only that portion of the exostosis which projected into the orbit; a long and difficult task, as it turned out.

Healing occurred rapidly, but three months afterwards the patient returned with a fistula in the upper lid which discharged pus freely. All attempts to close the fistula failed, its depth being so great as to render it practically inaccessible.

Several years passed without much change except that, little by little, the cicatricial contraction in the upper lid developed a pronounced ectropion.

In November 1894, *i.e.*, ten years after the first operation, the patient returned once again. On this occasion there was panophthalmitis of the right eye. Its vision had remained the same throughout the ten years, despite the ectropion, till fifteen days before he returned, when the eye became blind within forty-eight hours. Probably the exposed cornea had become ulcerated and infected from the pus of the discharging fistula above. Treatment now resolved itself into exenteration and cure of the ectropion—which was much more disfiguring than the original disease—by freeing the upper lid and uniting it permanently to the lower one. The fistula persisted in spite of all endeavours to heal it, but the discharge diminished considerably,

Case 2.—Florence M. age 65, came to the clinic on November 25, 1890. For two years she had noticed the presence of a hard tumour under the right eyebrow. There was nothing in her history, personal or hereditary, which could account for the growth. Six weeks ago a superficial abscess had formed at the level of the upper orbital margin; this was opened.

The right globe is pushed evenly downwards for a

distance of about $1\frac{1}{2}$ cm. There is ptosis on this side, while at the same time the upper lid is raised by a swelling that extends from the root of the nose, for some distance, above the orbital margin. Palpebral aperture very narrow; movements of the globe a little limited upwards; in other directions good. V. = R. $\frac{1}{3}$, L. 1. Ophthalmoscopic examination revealed no abnormality.

The growth was removed in its entirety without very much difficulty. Its point of origin was in the frontal sinus, the mucous membrane of which was suppurating; and it had penetrated into the orbit, replacing the normal superior wall of this cavity. Twelve days after the operation was performed the wound had healed. Vision of the right eye was raised from $\frac{1}{3}$ to $\frac{1}{2}$.

The patient was again seen more than four years later, in March, 1895. At that time she was in excellent health. The two eyes were absolutely alike, there was no trace of osteoma; there had been no pain, no abscess and no discharge from the nose, such as might suggest recurrence of the disease. In short, the cure had been complete, in spite of the advanced age of the patient and the presence of suppuration in the sinus.

Case 3.—An example of very pronounced osteoma in a man of 25 years. Left exophthalmos was first noticed six years ago. The globe was very much depressed, V. = $\frac{1}{6}$. There had never been headache. The ophthalmoscope showed venous congestion of the papilla. The growth was completely removed and the wound ran a normal course, healing rapidly. It should be noted that the mucous membrane of the frontal sinus, in this instance, appeared healthy. The eye regained its natural position, but a slight amount of ptosis persisted; possibly, says the author, owing to section of motor filaments during the operation.

Two years afterwards the patient was seen and seemed completely cured.

He was examined again in March, 1895, five years after the operation. At that time his general health left nothing to be desired. There was no proptosis of the globe but a slight depression about 1 cm. in amount. The eye move-

ment remained limited, except movement downwards. At the angle formed by the arch of the eyebrow and the root of the nose, a small bony tumour could be felt, and on pressure pushed a little backwards, with deep, barely perceptible, crepitation. No sign of inflammation in the sinus. Vision increased to $\frac{1}{4}$ and fundus normal.

Cases 4 and 5 occurred respectively in a young man, aged 22, and a woman aged 20. They resemble in many points the cases already described, so that it is unnecessary to give a detailed account of them. The exostosis was removed from the first of these two patients in January, 1892, and the wound healed quickly. A cicatrix due to a blow on the forehead nine years ago was present over the upper part of the tumour. He was seen again in December, 1894, nearly three years later; the note of that date being that the eye was perfectly in place in the orbit, and that there was not the least trace of the growth or inflammation in the sinus.

The operation on the girl (Case 5) was performed in January of this year, and there is no note of her condition since then. In her case there was great pain; indeed, it was the pain that the patient chiefly complained of when she first came, although there was marked proptosis and some depression of the globe. The tumour, which was an ivory osteoma, was removed, and healing occurred normally. Vision on the affected side was reduced to $\frac{1}{2}$.

Case 6.—The patient, in this instance, has so far refused to allow any operation, but he comes from time to time to report himself at the clinic. He is a man of 48, and says that for two and a half years the right eye has been gradually coming forwards between the lids, and that, simultaneously with the projection, diminution of sight on the same side has occurred. He suffered at first from frontal headache, but this has now passed off. All sorts of medical treatment have been tried without avail. General health has always been good. There is an indefinite history of some blows received on the head during his work, but nothing to suggest that these had any connection with his malady. No history of syphilis; no affection of

lacrymal canals. No pain now, but a sensation of creeping and tingling is present in the right half of the scalp and forehead. Sensation tested by means of the point of a needle is diminished over these parts. There is no nasal muco-purulent discharge and the patient does not think there ever has been.

The right eye is pushed markedly downwards and outwards. At the inner and upper orbital border a slight prominence can be detected, and palpation reveals the presence of a hard bony tumour at this spot, about as large as a small nut. It is, of course, impossible to say how far back the new growth extends. Ocular movements much impaired in all directions, but especially inwards. The globe shows no signs of irritation, unless we may include as such a moderate dilatation of the conjunctival veins, due, no doubt, to interference with the return flow. Corneal sensation normal, pupil of medium size and active to light; media clear. Ophthalmoscopic examination shows post-papillitic optic atrophy. The retinal veins are engorged and very tortuous, especially in the neighbourhood of the disc; arteries contracted. Tension normal. V. = perception of light.

With reference to the etiology of this complaint, the author points out that four out of the six patients are between 20 and 24 years of age. The progress of these osteomata is almost always very slow, and it does not seem unlikely that they may owe their origin to some mal-development of the frontal sinus. The entire period of growth of the frontal sinus is from about the second to the twentieth year of life, and the author suggests that by a process somewhat analogous perhaps to that which results in the occurrence of dermoid cysts, a bony tumour may gradually be developed. He notes also that inflammation of the sinus is not a necessary accompaniment to the growth of exostosis, as is evidenced by a study of his cases. The occlusion or not, of the fronto-nasal canal may probably have a good deal to do with the presence or absence of pus in the sinus.

This is an interesting and instructive paper; there are

many practical points to be learned from the details set down. Perhaps the chief of these is the desirability of reporting more cases of the same kind, so that we may have larger data whereon to base our conclusions.

N. M. ML.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

THURSDAY, NOVEMBER 14, 1895.

EDWARD NETTLESHIP, F.R.C.S., President, in the Chair.

Three Cases of Exophthalmic Goitre with Severe Ocular Lesions.—This paper was read by Mr. Jessop. Case 1.—Married woman, aged 40, had extreme proptosis of both eyes. She had never been pregnant, menstruation was always irregular, no enlarged thyroid. Operation of partial tarsoraphy on both eyes. Four days afterwards swelling of right conjunctiva set in, and was followed by crescentic ulcer of corneæ and chemosis of left eye. Both eyes then ulcerated, and the corneæ necrosed notwithstanding active treatment. The corneæ were reduced to Descemet's membrane and perforated. At present there is staphyloma of both corneæ and extreme swelling of the conjunctivæ. The patient is still alive but very weak. Case 2.—A woman, aged 35, under Mr. Power. Extreme proptosis of both eyes, both corneæ sloughed. The right eye was excised. Patient became insane and died. Case 3.—Woman, aged 24, under Mr. Vernon. Extreme proptosis; right eye sloughed, and was excised; left eye had recurrent attacks of superficial corneal ulceration. Reference was made to twenty-five recorded cases, seven

males and eighteen females. The results in the seven males were more severe than in the case of the females, and included four deaths; the ages were between 38 and 56. Of the eighteen females two died and ten lost both eyes; the ages were between 18 and 52. The results of three cases of partial tarsoraphy in women were the loss of both eyes in two instances, and one recovery with good vision, though there was superficial corneal ulceration.

Dr. Little had never seen a case bad enough to need union of the lids.

Mr. Power had removed the eye in his case because of the continual pain and discomfort; he thought there might have been something behind the eye. He did not think the ulceration was caused by exposure, as it was not uncommon to see cases in which the eyes were never closed even during sleep, and yet entirely free from any ulceration.

Dr. Mackenzie Davidson had had a case lately in which both corneæ were destroyed; the patient (a woman) became insane, but afterwards recovered. In another case he did tarsoraphy, and the corneæ were preserved. In a third case the surface of the cornea was entirely destroyed.

Mr. Lang had performed tarsoraphy in one case, but the stitches yielded, and both corneæ were destroyed. The stitches had had no harmful effect.

Mr. Johnson Taylor suggested that the suturing should be complete and not partial, and should be done as soon as the cornea was affected.

Mr. Lawford said in one case in which there was great proptosis with ulceration of cornea, he had united the lids at their centres instead of at the canthi; the result had been very good. He thought that union of the lids was a great safeguard.

The President had had five cases of exophthalmic goitre with damage to the cornea. His impression was in favour of lid suture, but it should be quite firm; in cases where the suture had been imperfect he had seen bad results. He

preferred wire sutures. One case was in a man, aged 52, with extreme proptosis and ulceration of one cornea. After suture the case did well. All cases were intolerant of any kind of irritation such as that produced by lotions or bandaging.

In reply, Mr. Jessop asked that all those who had had cases should put them on record, as there were very few reported cases, and the President's observations were interesting as showing the result of one form of treatment.

The Treatment of Detached Retina.—Mr. Wray read this paper. The results of treatment in a case in which the distorted vision began in 1885 were demonstrated. The patient was seen for the first time in January, 1893. The right eye contained a large detached retina involving about half of the fundus. The tension was decidedly raised, but the patient was and had been quite free from pain. As the other eye was blind,—the result of a penetrating wound, and had been so for many years, it was removed in the interest of the good eye. No more was seen of the case until January, 1895. The eye, under ophthalmoscopic examination, was found to contain a very large detachment, considerably larger than on the occasion of the last visit, so large, in fact, that although the media were clear, it was almost impossible to obtain a view of the disc. The tension was still markedly raised and the cornea slightly hazy. Vision reduced to hand movements at four to six inches. The case was subsequently exhibited at the Ophthalmological Society. On April 7 the patient was operated on by tapping the detachment, and a quantity of dark, yellowish fluid evacuated. He was then put to bed, atropine was freely used, and the eye firmly bandaged. Daily injections of pilocarpin were ordered, but had to be discontinued on the third day on account of his intolerance of the drug. A week later ophthalmoscopic examination showed that there still existed a detachment of very considerable size, though the vision was improved to fingers at three or four metres. After allowing a few days for the patient to recuperate, a second operation was done, with the result that vision improved to $\frac{6}{24}$ in a good light, and

the sight has fluctuated between that and $\frac{6}{36}$ ever since. The retina now appears in perfect apposition, and there exists, as is usual in such cases, a certain amount of choroido-retinal atrophy with pigmentation at the seat of the original detachment. The fields are much contracted, doubtless from the tension. The case proves that good may result from operative treatment, even when the detachment is large and of several years' duration. Mr. Wray thought that little was to be expected from pilocarpin, especially in elderly people and in those suffering from cardiac disease. As the perfect rest treatment with atropine and bandage entailed confinement to bed for at least three to four weeks under conditions which were barely tolerable, and with the prospect of almost inevitable failure, it would seem better to operate at once, especially as the operation is nearly free from risk if proper surgical precautions are taken; most surgeons do eventually operate after the failure of the simple treatment. Moreover as regards recent cases, speedy reattachment was necessary to prevent loss of function. If the subretinal fluid existed in any amount, several weeks would be required to obtain absorption and re-apposition, whereas anatomical union was desirable, and probably the absence of this latter explains many relapses. In chronic cases, there must be even less tendency to rapid absorption, and therefore it would seem reasonable to tap at once, so that the period of confinement to bed is spent in promoting an actual adhesion of the retina to the choroid. Cases unsuitable for operation are those where the macula is detached, where the vitreous contains numerous bands of contractile tissue, vascular membranes, large hæmorrhages, &c., and where the detachment is almost total, or the tension of the eye as low as — 3. A good result has been published in which the operation was done in a recent case with tension — 2. Clavelier's experiments proved that currents of 5 milliampères could be used for a minute without causing anything beyond transient opacity of the vitreous, and one operator published eleven cases in which he used electrolysis and obtained three instances of amelioration and two

cures. As such currents cause only a temporary opacity of the vitreous and leave no ophthalmoscopic changes behind, it is just possible that the beneficial results after electrolysis are due to leakage around the positive pole during the protracted period the needle is *in situ*. Constitutional remedies directed against gout, rheumatism, syphilis, &c., are slow in their action, usually depressing, and after long trial have not yielded results to warrant persistence in their use as therapeutic agents for an emergency, but should undoubtedly be used later on.

Mr. Devereux Marshall thought it unlikely that tapping the detachment where there was a growth would help the diagnosis by the examination of the fluid evacuated, as the tumour would not be broken up by tapping.

Mr. Jessop had found, according to his experience, that after tapping, the detachment returned or got worse. He had had one case in which the retina had become reattached after treatment by rest and pilocarpin; great pigmentation followed in the reattached area.

Dr. Little had operated a good many times. He had had only two cases in which complete permanent cure was effected; he had seen no recoveries without operation.

Mr. Secker Walker advocated withdrawal of the fluid, and at the same time injection of normal saline solution into the vitreous. Temporary glaucoma had ensued in one case, but it passed off. The retina remained attached five weeks, but subsequently the detachment returned again.

Mr. Lang had had two cases of spontaneous cure under simple treatment by rest. He had tried puncture by various methods without success.

Mr. Tweedy had operated by every possible method; he had never seen a permanent cure; he had seen improvement. He questioned the diagnosis in cases of cure. He thought, however, that it was right to do scleral puncture. The most successful case was that of a nurse who was myopic; the vision was reduced to hand movements. After rest and treatment by pilocarpin vision was restored to J. 1. The improvement lasted some time.

The President was able to give the further history of this case. He had seen the patient seventeen months

later; she was quite well, and there was no sign of detachment.

Mr. Power had seen it suggested that an injection of fresh vitreous of a cat or dog should be made into the vitreous with intent to reapply the retina by pressure.

Mr. Johnson Taylor asked if elaterium had been used as treatment by any of the members.

Mr. Grimsdale had seen Mr. Frost attempt to inject vitreous, but he had found it impossible to make the vitreous flow through a syringe.

THE OPERATIVE TREATMENT OF ENTROPION AND TRICHIASIS.

By JOHN B. STORY, F.R.C.S.I.

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SO many operations have been invented and practised for the cure of entropion and trichiasis, that we expect a new crop of them each year, and their young growth often enough springs up and chokes better methods which, if allowed their proper development, would be far more fruitful in alleviating the sufferings of mankind.

The publication of Dr. Kenneth Scott's ingenious and complicated operation for trichiasis in the September number of the Review induces me to describe again in the same periodical an operation which I have practised successfully for the last dozen years, and which I described in 1885 (OPHTHALMIC) REVIEW, iv., p. 72. It is an operation which can be done without either unusual dexterity or extensive experience, and there is nothing to prevent its being performed perfectly at the first attempt. If it by some mischance does not succeed perfectly, there is not the slightest harm done, and the surgeon can repeat the operation with equal ease and greater success.

The operation is a sort of offshoot from Van Millingen's operation described in 1881, but differs

considerably from its parent. Indeed it is probably owing to the non-recognition of these differences and to my having described the operation as a modification of Van Millingen's, that it has not met with the support which it deserves.

The operation is done as follows. Knapp's speculum being inserted, the inter-marginal incision of Flarer is made along the whole border of the eyelid, or if the trichiasis or entropion is only partial, the incision need only extend to a short distance beyond the two ends of the affected part. The incision must of course lie beneath the roots of the cilia, *i.e.*, all the cilia must be included in the upper of the two layers into which the lid is divided. It is quite unnecessary to make this incision a deep one. When the wound can be made to gape easily about 3 mm., it is quite enough. A piece of mucous membrane is then dissected off the lip, and this piece is sutured into the wound in the lid. Knapp's speculum can be fixed on the lip, too, which facilitates the dissection. The mucous membrane is to be the same length as the inter-marginal incision, and as broad as is necessary in order to keep the cilia off the cornea. For ordinary cases 2 mm. or 3 mm. at most is broad enough. It is marked out by two cuts of a knife, and dissected up with the help of forceps, and scissors curved on the flat. All fat is removed from it before placing it in its new bed. The important thing, I believe, is to suture it properly. This is best done by having a large knot on each suture. The needle armed with this suture is passed through one end of the mucous membrane from its external surface, and the thread is drawn through until arrested by the knot. The needle is then passed into the inter-marginal cut of the eyelid deeply at one of its ends, and is brought out through the skin of the lid at some distance—say, 8 mm. In tying the suture traction is made on the end attached to the needle, in order that the mucous membrane may be

tightly pulled down into the lid wound, and a definite interval should be left between the place where the thread comes out of the skin and the place where the suture knot is tied; if this is not done it will be found difficult to remove the suture afterwards.

A similar suture is inserted at the other end of the transplanted mucous membrane, and if necessary a third half way. If the piece of mucous membrane is stretched pretty tightly by the two end sutures, a third is not necessary. If the mucous membrane is well pressed by these sutures into the lid wound I find that it always lives. Hæmorrhage is unimportant. The wound is dressed usually with iodoform ointment, and the sutures are removed the second or third day. I rarely suture the wound in the lip.

The operation above described has been performed nearly 400 times in St. Mark's Ophthalmic Hospital since the publication of my paper in 1885, and the results have been almost uniformly perfect.

However, in estimating the merits of an operation it is not sufficient to assert that it has been successful in so many hundred cases, and that the percentage of failure is infinitesimal. Other operations by a different method succeed also, and will continue to succeed, more especially so long as they are performed by their authors or by the authors' pupils.

Some years ago I attempted to establish some canons of criticism by which the comparative merits of entropion operations may be estimated, and also made a rough classification of the different methods of operating (OPHTHALMIC REVIEW, 1883, p. 37). I may be excused for reproducing some of the conclusions arrived at in that paper, viz.: A good operation must effectively and permanently remove the cilia from their abnormal position of contact with the cornea. Cicatrices must not be left by whose contraction the inversion may be reproduced, and on the other hand there should be no danger of an

indefinitely continued contraction in the opposite direction to cause excessive eversion, or shortening of the eyelid. In a word, the result should not be dependent upon the existence of cicatricial adhesions of any kind, and the lines of incision should, so far as possible, follow the direction of the muscular bundles. No tissue should be removed unnecessarily, as in almost every case of entropion every structure in the lid becomes finally atrophic, and no unnecessary mutilation of the tarsus, with its already atrophic meibomian glands, should be undertaken. Finally, an operation should not produce any deformity or ugly scar, and should not, if it happens to fail, render the patient's condition worse by making a second operation more difficult.

The operations of any repute may be divided into those in which a portion of tissue, skin or tarsus, or both, is removed, and those which attempt to produce a cure without loss of substance. From what has been written above, it is evident that the operations contained in the latter group are to be preferred to those in the former. In the latter group the different methods adopted to prevent the return of the deformity may be reduced to three :—

(1) Cicatricial bands, which are liable to stretch or contract, and leave the final result a matter of pure conjecture.

(2) Fixing the cilia by immediate union to more or less fixed supports above.

(3) Supplying a support below whose presence prevents a subsequent inversion.

Of these methods, the third is much to be preferred to the second, as it is much more certain in its results, and these results can be much more accurately calculated. By a suitable flap of mucous membrane (or skin, if you please) the cilia can be removed any given distance from the palpebral margin, and kept there till the death of the patient.

It would be wearisome to describe in detail and criticise the numerous operations which have been invented, or re-invented, since 1885. Some are very similar to the operation which forms the subject of this paper, differing usually in providing a device which enables the operator to dispense with the sutures. In this respect I must regard them as defective. It may be asserted that the flap of mucous membrane never dies when properly sutured. In some of the operations tissue is cut away, in many of them the tarsus is cut across, and its lower end stitched out by threads or wires—a proceeding which I cannot but regard as unjustifiable.

The “incurved” tarsus seems to be a sort of old man of the sea, riding on the backs of our latter-day oculists. What harm comes of an incurved tarsus if no cilia touch the cornea, and even if you do get its curvature mathematically the same as that of the cornea, how long will it remain so? The simple insertion of a piece of mucous membrane, as above described, completely and permanently removes the cilia from contact with the cornea, does not shorten the eyelid, leaves the meibomian glands intact, produces no cicatrix to rub on the cornea—as, for instance, Dr. Scott’s operation does—and leaves an eyelid less deformed than is left by any other method.

CARCINOMA INVOLVING IRIS AND CILIARY BODY.

BY WILLIAM ROBERTSON, M.B.

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THE following case is of especial interest on account of the extreme rarity of tumours of epithelial nature either in the iris or ciliary body, whether they be secondary or very much more rarely of primary origin. To all appearance the particular growth seems to be not only epithelial but primary, as there is no manifestation of carcinoma elsewhere; it appears also to spring from the iris rather than the ciliary body.

Cases of primary tumour of the ciliary body have been noted by several authors, viz., Alt, who records a form of tumour seemingly highly glandular, by Michel, by Legrange, and lastly by Treacher Collins, who, in recording his case, remarks on the possible connection of the tumour with the quasi-glandular structure in the epithelium on the posterior part of the ciliary body.

It seems probable that this present case, although in many points similar to cases recorded, has a totally different origin, in so far as the edges spreading laterally are situated in the iris alone, and appear in close proximity to its uveal layer.

Primary carcinoma of the iris has not hitherto been described so far as can be found. Secondary carcinoma is exceedingly rare.

Mrs. M., age 75, came to the Eye Infirmary on May 17, 1895. She had complained of pain in the left eye and supra-orbital region for three months, the pain being of a paroxysmal character. She states that the eye had become inflamed at three previous periods. On examination, a yellowish pear-shaped body about the size of a split pea was found on the iris, its

apex close to the pupillary border, and its base reaching well backwards towards the periphery.

The tumour occupied the lower and inner portion of the anterior chamber, and lay in close contact with Descemet's membrane. The iris appeared to be pushed slightly backwards; the remaining portion of the iris was slightly discoloured, but the anterior chamber was of normal depth elsewhere. The tension was increased, and the vessels dilated and tortuous. On ophthalmoscopic examination, the optic nerve was found to be pale and cupped. Vision of left eye = J. 16.

The case presenting the usual features of intra-ocular tumour, it was decided to enucleate the eye. This was done on May 29, 1895, after which the patient recovered perfectly, and since then there has been no recurrence locally or elsewhere. I am indebted to Dr. L. Buchanan for the following extracts from his pathological report.

Pathological Report.—The eye is of normal dimensions, and the external coats retain their normal curvature and general appearance. The iris is discoloured, and appears to be inflamed, apart from the tumour. The lens is slightly grooved on its anterior surface at the lower and inner quadrant by the pressure of the tumour. The vitreous is clear and fluid. The retina and choroid are of normal appearance. The tumour, which is pale grey in colour, and is of firm consistence, shows on its posterior surface a tendency to fine lobulation. It is situated in the lower and inner quadrant of the iris, and grows partly from the iris and partly from the ciliary body, which latter it appears to displace outwards and backwards. In size the tumour measures 10 mm. radially, 8 mm. tangentially, and 5 mm. antero-posteriorly, and occupies the space from a point just beyond the inner edge of the iris to the peripheral portion of the ciliary body. The cut surface of the tumour shows that there is an indication of the uveal layer of the iris as a

slightly curved pigmented line in the centre of the tumour. Microscopic sections cut from the central portion of the tumour show that the growth is composed of small lobules lying in a fibrous stroma, and composed of epithelial cells of moderate size, which have large nuclei; in several of these karyokinesis is seen to be progressing. The lobules of the tumour mass are not for the most part arranged in any special order, and vary considerably in size and shape. The epithelial cells are arranged around the periphery of the lobules, but are tightly packed in the central portion, and show over considerable areas degeneration of colloid type. In the iris the tumour growth originates immediately in front of the pigment epithelium in small lobules, which present a curved line with a posterior convexity, and by its increase has separated the part into an anterior fibrous and a posterior broken pigment layer. In the ciliary body it can be seen that the ciliary processes have not been affected until at a late stage, and that the muscular bundles have also been implicated only after the growth had advanced to a state of degeneration elsewhere. The main part of the growth in the ciliary body is directly continuous with the growth in the iris. The tumour tissue passes into the canal of Schlemm, as is evidenced by the number of epithelial cells crowded into it. Sections cut from the upper portion of the tumour at its advancing edge show that the growth is not situated in the ciliary body at this stage, being only seen as a group of cells of epithelial type situated immediately in front of, and lying partially in the uveal layer of the iris near its ciliary attachment. From the edge it is seen that the ciliary body is not yet invaded, but that the growth consists of several groups of cells, still of epithelial type, sending processes anteriorly into the fibrous part of the iris, and posteriorly through the uveal layer, where they expand, and form rounded knobs, and, at the same time, extend outwards towards the ciliary body. From this

point the ciliary body is infiltrated by rounded lobules, which rapidly increase both in size and number, and send processes into the anterior chamber, one along Descemet's membrane apparently implicating the epithelium there, and another, separated from the former by a layer of fibrous tissue. The tumour appears to be of an epithelial nature, and is growing in the iris first, and later in the ciliary body.

W. VON ZEHENDER (Munich). On Certain Subjective Visual Sensations. *Klin. Monatsbl. f. Augenheilkunde*, March, April, September, October, November, 1895.

In a series of five highly interesting articles von Zehender discusses, in the light of recent scientific advances, the subjective phenomenon of rapidly moving sparks in the field of vision; the shadow pictures of the retinal vessels and optic nerve entrance; the visibility of the capillary circulation in one's own eye, and the visible movement of the pigment granules in the retinal epithelium. Before attempting to follow him in his observations and arguments, it will be convenient to state the theses in which he summarises them at the end of his final article. They are as follows:—

(1) The blood-stream in one's own eye can at all times be easily seen without artificial aid, and especially without finger pressure on the globe.

(2) The blood-stream which is visible in one's own eye, at least in the author's eye, is not in the retinal capillaries but in those of the choroid.

(3) The movement of the blood is not equable; it ex-

hibits quickening, slowing, down to complete arrest and reversal. The irregularity of movement appears to be influenced by intentional fixation.

(4) A movement synchronising with the heart-beat or with the breathing has never been observed by the author.

(5) In the phenomenon in question the vessel walls are absolutely invisible; the blood appears to flow in unenclosed paths.

(6) The bright points, visible with sufficient attention by day as well as by night, are the expression of "cell explosions," so called.

(7) Objective light, the adequate stimulus, acts primarily on the retinal pigment, and induces in it movement and disintegration (photo-chemical action); its action on the rods and cones is secondary. It appears that a similar influence may be exerted by the blood—an inadequate stimulus.

(8) Under favourable conditions the pigment granules and their movements are visible in one's own eye.

(9) The remarkable four-sided, six-sided, and many-sided figures lately described by many authors arise from the movement, displacement and altered arrangement of the pigment granules.

(10) These figures, which are pictures of retro-retinal objects, behave in many respects like the wall-pictures of a magic lantern. They are perhaps comparable with the vision of faceted-eyed animals. Movement of these pictures in association with the movement of the eyes or the head is not discoverable.

The phenomena discussed by Zehender are to be distinguished, on the one hand, from all visual sensations produced by objects external to the eye, and on the other, from the subjective conditions which belong to dreams, visions, hallucinations, and so forth, which represent mental rather than visual activity. They are subjective visual sensations produced by entoptic changes—at least they are thus explained by him. We shall refer first to the observations contained in his second paper, which relate to the well-known shadow picture of the retinal vessels.

Three methods of obtaining a shadow picture of the retinal vessels have been known since the time of Purkinje: (*a*) The eye is directed towards a dark surface, and strong light is focussed on the sclera at a point near the equator; the interior of the eye is thus illuminated through the sclera; (*b*) while the eye is directed towards a dark surface as before, a lighted candle is held at a few inches from it and is moved across the field of vision in various directions without crossing the fixation point; the retinal picture of the candle thus formed, becomes a source of light which illuminates the rest of the retina; (*c*) while the eye is directed towards the sky or other large bright surface, an opaque screen with a pinhole-aperture is held before it, and rapidly moved from side to side, or in a circular direction. Another method has been described by Ayres, namely, that of reflecting the light of a distant flame into the eye from a bright convex surface, such as that of a gold ring or silver spoon, held close to the cornea, and rapidly moved. We may note in passing that Ayres adduces this method as a refutation of the explanation given by Helmholtz ("Physiological Optics," p. 160) of the pinhole-method, and that Zehender speaks of the two methods as essentially different. Surely there are only two ways of applying the same principle. In each case the source of light is virtually a point very close to the eye, the point being obtained in the one case by the pinhole, and in the other by reflection from a convex surface. The same is true also of another method described by Ayres, in which the light from a distant flame is brought to a focus by means of a strong convex lens held at rather more than its own focal length from the eye.

Zehender's observation differs from the foregoing in that he is able, under certain circumstances, to see the shadow picture of the retinal vessels without artificial aid of any kind. Awakening from a short sleep, with book in hand, he saw at the moment of opening the eyes a transient but clear picture of the retinal vessels upon the page. Experimenting then with a sheet of white paper, he found that he could repeat the observation any number of times at

pleasure. It was necessary only to close the eyes for a moment while looking at the paper; at the moment of re-opening them, provided there were no movement of the eyes, the picture reappeared time after time. The nerve entrance was perceived as well as the vessels, and when both eyes were employed simultaneously two nerve entrances were clearly seen. The picture of the vessels appeared black, that of the nerve entrance rather less black. Movement of the blood was never visible.

Zehender doubts whether this phenomenon, so readily seen by himself, is not well known to many others, although hitherto hardly mentioned. He quotes passages from Purkinje, Fick and Aubert, which probably refer to a similar observation. He regards it as the result of a rapid transition from darkness to light, and as an illustration of the theory of assimilation and dissimilation of black and white propounded by Hering.

The chief interest of these papers lies in the observations which relate to the visibility of the choroidal circulation and the pigment epithelium. It is well known that under certain conditions, namely, in looking at a dazzling white surface, such as that of snow, at a time when the circulation is excited by violent muscular effort or by fever, there is frequently an appearance of a multitude of bright points in the field of vision, some of which appear and disappear without change of position, while others move rapidly and in various directions across the field in a manner which recalls the movements of the small shining beetles often seen on the surface of a pond. They are not to be confused with the *muscæ volitantes*, which are shadow pictures of objects suspended in the vitreous, and which also become unusually visible under the same conditions. After repeatedly directing his attention to this phenomenon, Zehender found that the bright points were readily visible to him not only under the special conditions of the circulation above described, or after finger pressure upon the globe, as some writers have stated, but at all times by night as well as by day, and with closed as well as with open eyes.

Most authors hold that these moving luminous bodies are blood corpuscles. Zehender shows that if this be true they certainly are not in the retina. If they were shadow pictures of retinal blood corpuscles they would, like other shadow pictures, be dark instead of bright. Moreover, they traverse the central area of the field which corresponds to the portion of the retina which has no vessels, and they are visible in darkness as well as in daylight. The idea that the choroidal circulation becomes visible under certain conditions is not entirely new. It was advanced by H. Muller and by Vierordt. Zehender develops this idea in detail. Seeing that pressure on the external surface of the eye can excite a subjective appearance of light, it is not unreasonable to suppose that the rods and cones may be thrown into action in a similar way by the movement of the blood in their immediate neighbourhood, in other words, that the bright points in question are microscopic phosphenes. The exact nature of the process by which light sets the rods and cones in action is still unknown, but recent advances in our knowledge of the visual purple, the movements and form-changes in the pigment epithelium under the influence of light, and the sensitiveness to light of cutaneous pigment spots in certain of the lower animals, all go to show that the primary action of light is on the pigment epithelium, and that this in turn influences the rods and cones. On this supposition it is not unreasonable to suppose that the rods and cones may be set in action not only by the influence of light falling on the pigment-epithelium from the front, but by chemical or other influence reaching it from the immediately subjacent choroidal plexus.

In olden times it was commonly believed that the light which visibly issues from the eyes of human albinos and of certain of the lower animals, originated in the eye itself. The truth with regard to this matter has long been known, but is it not possible, Zehender asks, that we have gone too far in asserting that no light whatever originates in the eye? Physiological chemistry teaches that the combustion process which is constantly going on in living

cells is accompanied by "explosions" of heat. Is it not possible that light in minimum quantity is developed simultaneously in quantity, that is, sufficient to feebly influence the immediately adjacent rods and cones? The phenomenon of phosphorescence, which shows that living cells are capable of emitting light, is probably no isolated exception, but rather an extreme expression of a process proper to all cells. Proof that the eye is itself a source of light could only be obtained by what Zehender terms ophthalmoscopy of the unilluminated eye—in other words, by looking into an eye in absolute darkness, or possibly by the help of the photographic camera. As yet, after many careful trials, he has failed to obtain any evidence by these means, but he does not, on that account, entirely reject the idea that living cells behind the retina may act upon the pigmented epithelium in a manner analogous to the action of objective light, and that they may therefore be regarded, in a sense, as luminous, though in very low degree.

In the final article Zehender describes the subjective phenomena which he attributes to a visible movement of the pigment granules in the retinal epithelium. When, with closed eyelids, and in bright light, we regard our field of vision we may observe a confused appearance of streaming in various directions, vertical, horizontal, curvilinear, or net-like. In darkness, whether the lids be opened or closed, we may observe a general waving movement, not amounting to the appearance of distinct streams which is characteristic of the movement of the blood. On the dark background innumerable spots of slightly paler shade are just visible. The general effect may be compared with the appearance of an ants' nest, where one is conscious of a general movement but does not sharply distinguish the units. The movement differs from that due to the blood stream in that the units do not travel from place to place, but merely alter their form, aggregating, separating, increasing in size, or diminishing. If we direct the attention indifferently to various parts of the field, they are not changed thereby. But if we direct it

fixedly to one part, the movement and the luminosity appear to increase at this part. After a few seconds the brightness of the fixation area reaches its maximum and is suddenly replaced by darkness, while the surrounding region becomes brighter, and this sudden change repeats itself so long as steady fixation is maintained. Whether this appearance in its highest intensity is physiological or pathological it is difficult to decide. The extreme form is identical, according to Zehender, with flickering scotoma. The readiness with which it is perceived depends largely upon the education of the perceptive faculty. Zehender can now perceive it with more or less clearness, almost daily, at the moment of waking from sleep. He regards it as physiological and as favoured by steadiness of fixation and by the sudden transition from darkness to light.

Further, he has satisfied himself that under favourable circumstances he is able to distinguish the individual pigment-granules in certain parts of the field of vision and to follow their individual movements. The pigment-granules are occasionally, for a short time, completely at rest, and thereby constitute remarkably delicate tapestry-like figures, occupying portions, or even the whole, of the field of vision. These figures are chiefly observable against the white ceiling in a half light at the moment of waking. Zehender is convinced that they are not hallucination, for he has been able to repeat the observation time after time. On attempting at the moment of seeing such a figure to transfer it to paper, he found that while he could project the pattern upon the paper he could not, in the dim light, see his pencil. He gives a drawing, however, of one of the simpler patterns observed, and quotes the evidence of other writers who have seen the same phenomenon.

What are the various conditions which render these subjective phenomena perceptible? In answer to this question Zehender points out that the pigment movements are influenced on the one hand by objective light, both natural and artificial, and on the other hand by absence of light. Secondly, that they are influenced, as he believes,

by the "inner light" which originates in the eye. Thirdly, that the action of the central nervous system, the will and power to see, must be taken into account. Lastly, that these three factors are capable of such infinitely variable combinations and variations, that it is impossible to define the conditions which command success.

It will occur to the reader of these papers that the success of the writer in this delicate line of observation probably depends on an exceptional perceptive faculty, and possibly on the fact that he is privileged to exercise this faculty to its full extent at a time of life when others would fail to do so, and may thus have a rare and exceptional opportunity of throwing light on the subject.

P. S.

EMIL VON GROSZ. On Sarcoma of the Uveal Tract.

Centralblatt für Praktische Augenheilkunde, December, 1895.

Although, comparatively speaking, a rare disease of the eye (its frequency has been variously estimated at from .04 to .06 per cent.), sarcoma of the uveal tract is of very great importance in view of its malignant character, and of the fact that surgical interference is likely to be of real benefit only if the diagnosis is made at an early stage. In the last of the four stages of the disease, viz., when metastatic growths have begun to form, the case has passed out of the range of the ophthalmic surgeon, if not, indeed, of any surgeon; in the third stage, when the growth has eaten its way through the coats of the eye, there is no difficulty in the diagnosis; but in the first stage, when the little tumour is concealed behind a detached portion of retina, and in the second, where the opacity of the media prevents the examination of the fundus of a glaucomatous eye, the diagnosis may be difficult, or even almost impossible.

Of the several portions of the uveal tract, the choroid is that which is most frequently attacked by sarcoma, the iris the least frequently—4·4 per cent. in 250 cases in the experience of Fuchs, 3 times in 29 cases, or 11 per cent., according to Grosz. Since the condition is visible to the naked eye when affecting the iris, such cases are usually diagnosed earlier and with more certainty than when more deeply-seated parts are attacked.

It is first manifested in the form of a brownish mass projecting into the anterior chamber, whose growth is not associated with any inflammatory reaction, thus distinguishing it from tubercle or gumma. The case becomes more difficult when the choroid is the part affected, but the steep, abrupt, motionless detachment of the retina, the vessels of the tumour often shining through the membrane, the dark colour, the absence of other causes (*e.g.*, myopia, injury) of detachment, and the increase—or, at least, the absence of diminution—of tension, all tend to point to the existence of tumour. It is said that, in a case of complete detachment of retina, if one instils atropine the tension will rise if tumour is present, but Grosz's experience does not lead him to agree with this impression. In doubtful cases, Hirschberg suggests puncturing the sclerotic, a procedure which will be followed by reposition of the retina if it be detached by fluid only; if a tumour be present, its outlines will become more sharp and manifest. Fränkel recommends testing the consistency of the detaching substance by means of a cataract needle introduced at the opposite side, and guided to the affected area under the control of the ophthalmoscope. Fuchs introduces the needle on the corresponding side, and notes its mobility. But the media are often too opaque to render these plans available; electric illumination of the globe has not been found to be of much utility.

It is not, as a rule, difficult in the second stage to recognise the condition from primary glaucoma, but as points of diagnosis the following are useful. In uveal sarcoma the eye is blind before the tension rises; the pains are continuous, and the eye is stony hard; not infrequently the

detachment is visible in spite of the haze in the media ; only one eye is attacked ; iridectomy does not reduce the tension ; and the engorgement of the episcleral veins is most marked at one portion.

But because the difficulty of diagnosis is not always inconsiderable, Grosz set himself to discover some new diagnostic points, with which purpose he carefully analysed, chemically and microscopically, the fluid which escaped from three eyes enucleated on account of sarcoma. In two of these he found that the highly albuminous fluid contained numbers of pigment cells of various sizes and shapes, which probably found their way thither from the tumour. (In the case of the third eye he was not able to open the globe till the ninth day after enucleation, by which time the cells, if they had been present, were broken up.) He next intended to proceed to examine the fluid obtained by tapping the sclera in cases in which tumour had been diagnosed ; but, first of all, he had to prove that the fluid behind the retina, in cases of *simple* detachment, did not contain pigment cells derived from the pigment epithelium ; this he succeeded in doing to his satisfaction. He has attempted, in two cases of detachment by probable tumour, to obtain fluid from behind the retina, but has, unfortunately, failed to do so, as the detachment area was too small to yield enough for investigation. As yet, then, he cannot be said to have succeeded in showing that the microscopic examination of fluid obtained by this diagnostic puncture is likely to be of value.

In regard to the question of prognosis in tumour of the choroid, out of 27 cases 14 only are available, because no news could be obtained of 8 patients, and two years had not elapsed since the operation in the cases of the other 5 ; one cannot predicate anything of the final result in so short a period as two years. Of these 14 patients, three were well and healthy at an interval of 7, 10, and 14 years after the respective operations. One patient died 7 years after operation, probably of another disease ; another returned after 5 years with a recurrence in the orbit ; 9 died of metastatic developments. Taking into account (as

cures) the 3 living cases, and that also of the patient who died after 7 years of another disease, 28 per cent. of the cases were entirely successful. Adding two successful cases from the practice of Professor Schulek, he obtains a percentage of cures of 37. Fuchs reckoned that out of 15 cases 6 per cent. were alive after four years, and 86 per cent. had died of the disease. Hirschberg's results, gathered from 8 cases, were a little better, for in 25 per cent. the patients remained healthy. Freudenthal found 37 per cent. of cures in 16 cases; in one of his cases in which an abdominal metastasis occurred, the secondary tumour first became manifest seven years after the primary operation.

It is quite obvious that the earlier the operation is performed the better is the prospect of success, both as regards local return and metastasis, but even if operation is performed during the first stage, these misfortunes are not entirely obviated. Only one of Grosz's patients was operated on in the first stage, and he died of metastasis; another was operated on just at the inception of the second stage, and recurrence took place locally five years later. In both these cases, it is worthy of remark, the tumour originated in the iris. Of those patients whom he regards as permanently cured, two were operated upon in the second, and two in the third stage. From a comparison of the results obtained by himself and others, he considers that about one-third of the patients are saved by timely operation; but the unfortunate feature is that patients will rarely submit to treatment so drastic in the early stages, and during that period a diagnosis of tumour cannot very often be made with confidence.

As regards age and sex, the youngest of Grosz's patients was 22, the eldest 71, the average being 45 years; Fuchs gives the average at 44, Lawford at 58, Freudenthal at 49; 51 per cent. were women; of Fuchs's patients 44 per cent., of Lawford's 25 per cent., of Freudenthal's 20 per cent., were women.

W. G. Sym.

L. VIGNES. *Technique de l'Exploration Oculaire. Introduction à l'Étude de l'Ophtalmologie.* Paris, A. Maloine, Éditeur, 1896 (pp. 419, xii., 213 figures).

No one beginning the special study of the eye could fail to profit by a perusal of this book, of which the main title, however, is a little misleading ; for it deals quite as much with the groundwork of ophthalmology (facts of anatomy, physiology, and optics) as with the actual technique of examination. If regarded solely as a manual of technique one might well complain that much of its contents is superfluous, but viewed as an introduction to ophthalmology it is both comprehensive and consecutive, whilst the author's lucid style makes the reading of it pleasant and easy. The first hundred pages are devoted to the anatomy of the eye ; then follows an exposition of general optical principles, and an account of the eye as an optical instrument. The use of the ophthalmoscope is fully entered into, and short but sufficient accounts given of oblique illumination, ophthalmo-skiascopy (retinoscopy), ophthalmometry and keratoscopy. The author favours the use of the plane mirror in skiascopy.

The chapter on visual sensations includes the subjective determination of the refraction, the measuring of the field of vision and the localising of scotomata in it, determination of the light sense, colour sense and the field for colours. The chapter on binocular vision is perhaps the best in the book, and deals with matters which, while of much practical import, are yet in ordinary text-books not sufficiently set forth.

In the last chapter, after a short section on clinical examination, the treatment of the various conditions of refraction and the ordering of glasses are considered—matters which hardly seem to come within the scope of the work.

There are some omissions ; for instance, there is no reference to the use of Maddox's disc, which is of so much value in determining the state of balance of the ocular muscles. But in spite of this, the book remains a clear and trustworthy guide, and as such can be strongly recommended.

A. GIFFORD (Omaha). An Orbicularis Pupillary Reaction. *Archives of Ophthalmology*, xxiv. 3.

For some years the author of this paper has observed a pupillary reaction which he has not found mentioned in either the ophthalmic or physiological literature at his command. The reactions generally recognised are contraction on exposure to light, and on efforts of accommodation and convergence; dilatation on the withdrawal of light, and on the stimulation of the sensory nerves, as well as in certain emotions.

The reaction to which the author refers is one which occurs when a forcible effort is made to close the lids. It can best be observed, as on consideration is sufficiently obvious, on a subject blind or nearly blind from some disease of retina or optic nerve. If such a patient be told to close the eyes tightly, the lids at the same time being held apart by the observer, the pupils are almost always seen to contract perceptibly, and sometimes very markedly. It not infrequently happens when the effort is made to close the eyes and resisted by the observer as described, that the eyes roll upwards so far as to render the pupil invisible while the orbicularis contraction is in progress, but as soon as this is relaxed, and the pupils come into view again, they are seen for a moment to be contracted, though they quickly dilate to their usual, or even more than their usual, size.

It is impossible to try this experiment under ordinary conditions of light with subjects whose vision is good, because the contraction maintained by an ordinary well-lighted room is greater than that caused in most eyes by this orbicularis contraction. It is best, therefore, to use a dark room with light from the side, and of not greater intensity than is sufficient to allow the action of the pupils to be accurately observed. Under such circumstances the reaction mentioned, says the author, can be seen plainly in the great majority of eyes; in a few it is very slight, while in a still smaller percentage it is so slight that it is questionable whether it really occurs. It is best to hold

the lids of *both* eyes open during the test, but with some people the contraction can be observed without holding the lids open at all; if they simply shut the lids firmly the pupils, when the eyes are quickly opened, are seen to be contracted, though less than when the lids are forcibly prevented from closing. It is preferable, however, to keep the lids open throughout, for otherwise the sudden access of light when the eyes are opened is apt to cause a still sharper pupillary contraction than that caused by the action of the orbicularis.

The author is careful to explain that he speaks of this pupillary contraction as the orbicularis reaction mainly for the sake of brevity, for it is difficult or impossible to prove that the stimulus for the pupillary contraction comes solely from the orbicularis centre. He thinks it probable that "it is simply the result of an overflow stimulus, that the intense activity which the attempt to close the lids excites in the cells of the nucleus of the orbicularis fibres of the facial overflows, so to speak, into the cells of the pupil contraction centre."

This reaction cannot, he argues, be merely the result of a stimulation of the convergence centre, inasmuch as when the attempt to close the lids is made, the eyes are often slightly divergent. It not infrequently occurs that with the first effort to shut the eyes they turn upwards and make a conjugate lateral movement to one side or the other, or perhaps alternately from one side to the other; less often there is convergence at first, but nearly always, if the effort to close the eyes be kept up long enough, the axes become more or less divergent (the pupil contraction continuing meanwhile) and remain so until the orbicularis contraction is relaxed. The writer adds: "The fact that in some of the cases in which the orbicularis pupil-reaction could be observed but slightly, or not at all, the patients, when told to shut the eyes, kept looking straight ahead instead of rolling the eyes up, made me suspect that the pupil contraction might depend upon the action of the superior rectus, and I have found, as a matter of fact, that with some people a slight pupil con-

traction does take place when they simply look up sharply but this superior rectus pupil contraction does not nearly equal in constancy or extent that occurring with orbicular contraction."

In answer to the suggestion that the orbicular contraction may excite the action of the ciliary muscle, and thus bring about a—so to speak—accommodative contraction of the pupil, it can in some cases at least be clearly shown that this is not so, since with these patients the utmost effort of the accommodation and convergence fails to produce as marked a contraction of the pupil as that caused by the forced attempt to close the lids.

For instance, in the case of a girl, age 13, whose right eye was blind, but who had full vision and normal accommodative power in the left, the pupils contracted only to about 6 mm. when she looked at an object placed at her near point, while under the stimulus of the forced action of the orbicularis they contracted to nearly 3 mm. Moreover, and this is stronger evidence on the question, the writer has observed the same phenomenon in several patients whose eyes were quite healthy. In the great majority of cases, he says:—"if the test is made by good daylight or even by gaslight coming from the side in a dark room, the pupil contraction accompanying convergence and accommodation is greater than that caused by the orbicularis contraction; but if the light is made as dim as is consistent with accurate observation, it will every now and then be found that the near vision contraction does not equal the orbicularis contraction." This, the author thinks, implies that while the contraction due to the orbicularis is independent of light stimulus, the narrowing of the pupil accompanying near vision cannot reach its maximum except in a good light.

As a further proof of the independence of this pupillary reaction from those which follow the more recognised stimuli, it should be noted that Gifford has observed several cases, where, owing to disease of one kind or another, no perceptible contraction of the pupil occurred on stimulus from light, convergence, or accommodation,

and yet where a definite if slight contraction followed an attempt to close the lids against resistance.

From close observation of this phenomenon in many instances, the writer has been led to conclude that the orbicularis pupillary reaction is chiefly, if, indeed not wholly dependent on the contraction only of that part of the muscle which moves the lids, *i.e.*, of the palpebral not the peripheral fibres.

This pupil reaction is perhaps more interesting from a physiological than a pathological point of view, and tends, so far as it goes, to confirm Mendel's hypothesis, that the orbicularis derives its nerve supply in part from the third nerve nucleus, and not only from the seventh. Moreover, if the author is correct in his belief that it is associated only with contraction of the palpebral fibres of the orbicularis, this would seem to indicate that in man, at any rate, the oculo-motor origin is more evident in the nerve fibres supplying the palpebral than the other parts of the muscle.

N. M. ML.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

THURSDAY, DECEMBER 12, 1895 (CLINICAL EVENING).

EDWARD NETTLESHIP, F.R.C.S., President, in the Chair.

Case of Retinitis Circinata.—This was shown by Mr. Hart-ridge. It presented the appearance of a grey degeneration at the yellow spot, with a mass of white deposit in the nerve fibre layer of the retina radiating from the yellow spot region. There were no retinal hæmorrhages: it did not agree in every detail with the recognised appearances,

but he thought it was possibly an early stage of retinitis circinata.

Mr. Holmes Spicer thought that the characters of the white exudation in this case were more like those of renal retinitis than of retinitis circinata. In all the undoubted cases that had been observed there had been a remarkable constancy in the character of the exudation, a grouping quite different from that shown in this case.

Dr. Habershon asked if there were renal disease or hypertrophy of the heart present.

Mr. Hartridge replied that there was no renal disease; the heart had not been examined.

Rare Form of Nystagmus.—Mr. Ernest Clarke showed one case and Mr. Grimsdale three cases of nystagmus in the fixing eye on occlusion of its fellow. In Mr. Clarke's case the vision with the two eyes together was $\frac{6}{6}$; when either eye was occluded by placing a card in front of it, the uncovered eye immediately began to oscillate violently. In Mr. Grimsdale's cases the nystagmus was of the same kind but less marked.

Dr. Habershon had examined Mr. Clarke's patient. There was no sign of actual nerve disease, but he was of a neurotic type; all his reflexes were rather more pronounced than usual.

Dr. Ormerod remarked that the patient was a jeweller, and had been using a single watchmaker's glass to one eye; he thought this may have partly caused the nystagmus. It was not present before he began that work.

Superficial Peripheral Choroiditis.—A case of peripheral choroiditis of obscure origin was shown by Dr. Rayner Batten. The patient was a woman, aged 40. The choroiditis was limited to the periphery; the outline of the patches was irregular, map-like; the deeper layers were not affected, but the surface layers had a bleached appearance; vision was almost unaffected except for the contraction of the fields. No evidence of acquired syphilis could be found; the condition was probably a late manifestation of inherited syphilis. It was still progressing.

Mr. Holmes Spicer thought the cause of the disease in Dr. Batten's case was hereditary syphilis, because of the white lines along the smaller veins, which were a common feature of that affection; for the same reason he thought it had been progressing comparatively recently.

Embolism of the Central Retinal Artery.—Mr. Marcus Gunn related the case of a young adult in whom this lesion occurred, without evidence of cardiac disease. About three weeks ago there was sudden failure of the left eye, with the appearance of a thick film before it, in a young anæmic girl. The vision had somewhat recovered in part of the field since. She was suffering from amenorrhœa at the time. Although there was not much change in the size of the arteries, there was the typical cherry-red spot at the macula. Although at first he regarded it as a case of embolism, he had since thought that it might have been a hæmorrhage into the optic nerve sheath which had affected the vascular supply of the nerve.

Mr. Hartridge had lately seen a case of embolism of the central artery in a healthy man two and a-half hours after its occurrence. There was already œdema of the retina.

Mr. Bickerton had seen a case recently in which there was very little appearance of change in the vessels. The pupil acted to light.

Dr. Batten had recently seen a case of sudden failure of sight in an anæmic girl, in which there had been little change in the vessels.

Mr. Drake-Brockman had seen some time ago a lady who had a sudden attack of giddiness; she lost the sight of one eye completely. There was no cardiac disease and no albumen, but the patient was anæmic.

Retrobulbar Optic Neuritis.—Mr. Holmes Spicer showed this patient, a healthy man, 68 years old, whose sight had been failing for seven months. He had been a great smoker, but had given it up. There was no history of rheumatism, gout, or syphilis; no locomotor ataxy nor disseminated sclerosis, no renal disease nor diabetes. The optic discs were very pale and slightly swollen. The fields were quite

full, but he had a large colour scotoma at the fixation point. The case presented all the features of a severe tobacco amblyopia, but recovery had not followed abstention from the poison; he had got steadily worse.

Mr. Griffith thought the pallor in this case was too great for tobacco amblyopia.

Mr. Johnson Taylor thought it was an aggravated case of tobacco neuritis combined with alcoholism.

Dr. Habershon thought that this case occupied a place midway between tobacco amblyopia and the family cases of optic atrophy described by Leber.

The President said that cases were occasionally seen in which the action of tobacco did produce much more grave results on the nerve than was customary, and this generally occurred in old men. He thought it not improbable that this case might be one of tobacco amblyopia in an old man.

Recurrent Paralysis of Third Nerve with Migraine.—This case was shown by Dr. Ormerod and Mr. Holmes Spicer. A boy, aged 15, had had complete paralysis of the left third nerve when a year old; recovery took place. When he was about seven years old he had a second attack; since then he had had an attack every nine or ten months. He was subject to "bilious" attacks, with intense headache in the left side, and the paralysis always came on during a bad attack. There was some atrophy of the left optic nerve, and some of the paralysed muscles now never recovered. The present attack was passing off, but there was still slight ptosis, a dilated pupil, and complete paralysis of the external muscles of the eye supplied by the third nerve.

Double Ptosis.—Mr. Waren Tay showed a case of recent double ptosis with loss of convergence and weakness of the internal recti. There was no apparent cause for the attack; at first the movements of the eye were good, but complaint was made of diplopia; later the failure of convergence was marked. Recovery quickly followed the use of iron and nux vomica.

Paralysis of Both Internal Recti.—This case was shown by Mr. Treacher Collins. A man, aged 22, had suddenly had paralysis of both internal recti five days ago, accompanied by headache. He was unable to move either eye towards the nose, either in looking to one side or in convergence. The pupils acted normally, and vision was good; his gait was unsteady, his knee-jerks were exaggerated, and he became unsteady on standing with his eyes closed.

Peripapillary Atrophy of Choroid of unusual character.—The case was shown by Mr. Donald Gunn. There was a patch of atrophy around the O.D., the retina over the patch being raised, distended, and perfectly clear, with shining lines in it like a cracked ball of glass.

An eye lost after removal of a foreign body by the electro-magnet was shown by Mr. Spencer Watson, and a specimen of Papilloma of Conjunctiva by Mr. Jessop.

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The Ophthalmic review

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